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The Canadian
Medical Association Journal

Vol. X. TORONTO, MAY, 1920 No. 5

THE ONTARIO MEDICAL ASSOCIATION REORGANIZATION

By J. Heurner Mullin

Hamilton

IN discussing the progress and development of the Ontario Medical Association, with some of the members at the annual meeting of the Canadian Medical Association last year at Quebec, it became evident that it would be of interest to the many members of the larger organization, both in our own, and in other provinces, to have for their consideration a shore résumé of its recent reorganization.

About ten years ago it occurred to certain members who had been active in the organization work of the Ontario Medical Association, that the time had arrived for extending the efforts of the Association beyond the mere preparation for, and the actual conduct of, the annual meeting. Various suggestions were made for increasing the registered membership at these meetings, but still the Association failed to represent more than the few who attended these meetings and paid the small fee.

It was easily seen that it was futile to attempt to accomplish any real business in the ordinary business session, as previously provided for. A small attendance, barely a quorum, composed of a few enthusiasts only, and the room almost empty when the business session was announced at the close of some scientific papers, was the usual experience. Little actual progress was made until a special committee was appointed at the annual meeting in Peterboro in 1915.

Fortunately for the future of the Association, a very excellent committee was selected, consisting of some who had the benefit of years of experience, together with a liberal addition of new and

younger members, who were keenly alive to the possible advantage of some attempt being made to stimulate a larger organization, through the medium of local units, such as existed at that time, namely, the city, county or district organizations.

This committee studied the methods of organization as illustrated by the British Medical Association and the various State organizations across the line. It was soon found that the organization in vogue in the latter adapted itself more easily to our ideals. Working on this basis, a revision of the constitution and by-laws was prepared and submitted to the members for their consideration and was finally adopted at a special meeting of the Association held in Toronto in October, 1917. Under the revision the basis of the business organization was dependent upon the formation of what has been termed the committee on general purposes, consisting of representatives from the various local and district, or county societies.

This committee and its various duties are described in our new constitution and by-laws as follows:

Each local or territorial society affiliated with the Ontario Medical Association shall delegate annually its president, *ex-officio*, and one representative for every fifty members or any part thereof to act on the committee on general purposes These representatives shall be named by each society as soon as possible after the annual meeting of the Ontario Medical Association, and continue in office until their successors are appointed.

This committee shall as far as possible be responsible for the business affairs of the Association All new business must be first submitted to them for their consideration before being taken up in the general sessions of the Association. They shall submit their report on all questions for final action in the general session of the Association. The executive shall be *ex-officio* members of this committee.

Fifteen members of this committee shall constitute a quorum.

It shall be the duty of the committee on general purposes:

To meet the day prior to the annual meeting of the association and at such other times as may be deemed necessary by the president and executive, or upon a request in writing signed by twenty-five members of the Association.

To receive and discuss the reports of all committees, except that of the nominating committee, and forward them to the general meeting with such comments and recommendations as may be deemed necessary.

To suggest, consider, discuss or prepare all new business for presentation to the annual meeting.

To hear petitions, appeals, recommendations, complaints, or, consider any business originating in or relating to affiliated societies and being for the general welfare of the public, profession, or the Association.

To consider and determine the limits of jurisdiction of any local or territorial society or association, and to report on all disputes regarding the same.

To report upon all matters affecting the relationship between the Ontario Medical Association and the Canadian Medical Association and instruct the representatives of the Ontario Medical Association upon the executive of the Canadian Medical Association.

To nominate ten counsellors and define group of county societies which each represent.

To elect the committee on nominations as provided for in article IV, section 3.

The first actual meeting of the committee on general purposes was held during the annual meeting in Hamilton in 1918. Under the careful guidance of the chairman, Dr. G. S. Cameron, the new machinery was most successfully set in operation and it was soon evident to all that the new method of discussing business and preparing the same for the general session was an absolute necessity

In the course of the preparation for the meeting in Hamilton, certain weaknesses in the constitution and by-laws occurred to some of those who were interested. Amendments were offered which took care of these deficiencies One of these amendments had to do with the formation of the executive committee, whereby certain additional members were added, these being called the counsellors. Each counsellor represents several county societies, and in addition to general executive work, is expected to assist, when requested, in the preparation of the county society programmes.

The counsellors with the augmented executive and the committee on general purposes, become the training school for the future officers of the Association. While some element of permanency is necessary in the personnel in order to develop established policy, it is equally necessary, in the interest of the democratic spirit we have hoped to establish, to frequently introduce new blood into the executive of our organization.

Through the medium of this augmented executive, the central or continuously working parts of the machinery are better able to keep in touch with the various parts of the province throughout the year.

In other days the executive rarely met before the actual time of the meeting, perhaps not more than once or twice during the year, and then only for a short social gathering. Little business other than putting the new president in touch with the work necessary to carry on the business of the meeting was accomplished.

During the past two years we have seen a complete change in these methods. The executive meets regularly at least every two months during the whole year, and it has been most encouraging to find busy doctors, coming from various points of the province, earnestly endeavouring to be of some service in the development of the organization. At all the executive meetings straight business has been the rule. In the discussion of the various problems, or matters which appear in the course of routine, their sound judgement and different view points, based on years of experience in varied daily lives, have been of considerable value in shaping the policy of our organization.

All the work of the year is not allotted to the few of the executive. We still have our standing or special committees, and it remains the duty of the individual member of each of these to practice those principles, in willing service, which will safeguard our democracy in the future.

In order to make the work of all the committees more effective at the time of the annual meeting, their reports are printed and distributed to the members present at the time of registration It then becomes possible for each member to read and study the reports at leisure, before they actually come up for discussion in the committee on general purposes, or at the general business session.

During the last meeting in Toronto, a larger space of time was allotted to the committee on general purposes on the day preceding the actual meeting of the Association as a whole, and in spite of this it was necessary to hold two supplementary sessions in order to complete the business.

In the committee on general purposes, we find great advantage in having the representatives coming from various parts of the province from the local, county or district societies, as the case may be. These meetings, in this second year of the organization, were even more successful than in the previous year.

The members of the committee on general purposes soon discovered that they had considerable interest in the machinery and that, in their acceptance of these responsibilities, each had real duties to perform in order to make the interest and influence more widespread and effective. This committee has now become the

real parliament of our profession and its possibilities in the development of the organization are manifold.

Can we induce the various individual units which are now undeveloped, the local, county or district societies to complete their organizations? The wheels of democracy move slowly and it is difficult to get all to realize their responsibilities and possibilities, but surely when each individual in the local unit is willing to play his or her part we shall have in Ontario a profession thoroughly alive and active.

Before this result can be attained we must provide some method of keeping our members in communication with the central office. An attempt has been made in this direction during the past year by preparing a summary of resolutions and discussions which took place at the business sessions. Each member in good standing will have mailed to him a copy in printed form.

Probably the most important advance in the development of the organization will depend on the local units taking advantage of the activities of the committee on post graduate extension courses, or as it is now called, the committee on education. This committee proposes that the members of various university staffs or other members should, acting through the agency of the central office of the Association, make it possible for each local or county society to have available at their own door the benefits of the latest developments in instruction in medicine in all its branches.

In the course of time, it is expected that the central office will become an intellectual clearing house which will raise the standard of medical practice, and make for unity in our profession.

In the utilization of the above machinery considerable steam has been turned on through the activity of the present honorary secretary. With his assistance it has been possible to so develop the office, that no one who is actively interested can fail to realize its importance.

The central office which has been established with its proper secretarial assistance, and other requirements, has become absolutely an essential feature. Correspondence must receive prompt attention. Records must be properly filed. Information required by the profession bearing on its organization and further development must be made easily available to all of our local units. We have reached a stage in our growth when the medical organization in the province demands an efficient officer who will be able to devote the greater part, if not his whole time, to these duties.

Evolutionary processes, stress of war and present contingencies, have amply demonstrated that our organization needs stimulation

and extension as well as cohesion of its component parts. The medical profession of Ontario needs organization, and if its representative body, the Ontario Medical Association, is to take its proper place and carry on, it must have the interest and support of the profession. Our aim should be to enroll all the eligible practitioners of Ontario so that the association will be truly representative of the profession, and so carry weight in respect to all matters affecting the profession and the relation of its members to the state and to the public.

In these days of reconstruction much is heard of "forward movements". The church has undertaken such on a gigantic scale and it is no less necessary for the medical profession of Ontario to carry on a "forward movement" if it is to hold its own and keep pace with the evolution and requirements of the immediate future. At the last annual meeting of the Association, the suggestion was approved for raising funds in addition to that received from the annual fees, in the form of a voluntary guarantee subscription. At a recent meeting of the executive committee it was decided that a committee should be appointed to undertake the duties of arranging details for making a general appeal to all of our members. It was determined that county and district societies should be asked to coöperate in order to facilitate the work of the committee. It has been proposed that as many members as possible should be asked to pledge themselves for at least ten ($10) dollars, per year, for a period of three years. Undoubtedly further suggestions will be prepared by the committee and in due time be submitted to all members for their consideration.

Our Association should strive to afford each of the individual members every possible opportunity of keeping more continuously in touch with the developments in the organization and what is best and latest in the developments of medical science. Whether this should be done by monthly bulletin or journal is a matter which must seriously be considered at our next annual meeting

Many of us now believe that this can be done without injury to the efforts of our parent organization, the Canadian Medical Association. The more effectively and rapidly the organization of the profession in this province is comple ed, the more assistance can we give to what must be the larger and more influential body.

Organization, together with more education, through the medium of the suggested extension courses, cannot fail to be of the greatest possible benefit to the members in this province, to the Canadian Medical Association, and to the public at large, whom we hope more efficiently to serve.

THE UNION OF SEPTIC COMPOUND FRACTURES

By W. E. Gallie, M.B.

Toronto

IN this paper it is proposed to discuss briefly some phases of the pathology and treatment of septic compound fractures, which the experience of the past four years has done much to elucidate.

In 1916 a paper was published by Leriche of Lyon in which it was advocated that as soon as possible after a gunshot wound of one of the long bones had occurred, an operation which he called "esquillectomy" should be performed. This consisted of a wide excision of the wound, subperiosteal resection of the whole area of the fracture including all bone fragments, careful preservation of the periosteal tube, and efficient provision for drainage By this operation it was claimed that the amount of sepsis could be reduced and that limbs which would otherwise be sacrificed could be saved. It was maintained that if traction were properly applied and the fragments immobilized in efficient splints, the portion of the shaft which had been resected would be restored by the growth of new bone from the periosteum, and that ultimately a solid union without shortening would be obtained. This happy outlook was based on the classical experiments of Ollier of Lyon, which seemed to show that the periosteum is the important structure in bone repair.

Unfortunately experience has not upheld Leriche's contentions. During 1917 great numbers of cases were treated as he directed and the common result was persistent non-union. Further, there is much doubt as to whether the extensive operative interference really did lessen the severity of the infection. So uniformly did this treatment result in non-union, that towards the end of 1917, instructions were issued that the operation should be discontinued.

To those who have believed with Macewen that the periosteum is not osteogenetic, these results did not cause surprise. If, as Macewen contends, the periosteum is only a fibrous membrane

Read before the Chicago Medical Society, December 3, 1919.

which, when reflected, is devoid of osteogenetic cells, it would be folly to expect restoration of long segments of the shafts of bones after subperiosteal resection. That Macewen's conclusions are substantially correct has been demonstrated to us by a series of experiments on animals which have been elsewhere described.* These experiments were practically a repetition of Macewen's, with some modifications. One series consisted of the reflection of the periosteum from the radii of dogs, leaving a sufficient pedicle to maintain the circulation, and the placing of such foreign materials as tin-foil, paraffin-wax and steel plates between the reflected membrane and the bone. In another series, living tissues such as muscle and tendon were substituted for the foreign materials; and in a third, heterogenous bone from a living cat was placed beneath the periosteum. In none of the experiments did new subperiosteal bone appear. These findings were supported by a series of experiments in which autogenous bone was transplanted, with and without its periosteum, from the radius to the muscles of the back. New bone appeared on the periosteal surfaces in each case, but th presence or absence of the periosteum appeared to have no appreciable influence on its amount. Finally, a series of subperiosteal resections of bone was performed, and in each instance, unless the gap to be bridged were very small, the space became filled with fibrous tissue, and non-union was the result. Such experiments demonstrate very conclusively that periosteum cannot be depended upon for regeneration of segments of resected bone.

It is clear, therefore, that, if union is to take place, other factors must be introduced besides the preservation of the periosteum. Clinically we know that one such factor consists in bringing the fragments into apposition and holding them there by efficient splinting. If the ends of the bones are healthy, union usually occurs. Another factor contributing to prompt union of a fracture is comminution of the fragments. It is common to see more rapid union and much greater callus formation after comminution in simple fractures than after ordinary transverse fractures. No surgeon performs a transverse osteotomy of the diaphysis of a long bone in an adult without anxiety as to the rapidity of union, and many cases are recorded in which complete non-union has been the result.

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*"The Repair of Bone", Gallie and Robertson, *British Journal of Surgery*. October, 1919.

Some years ago an experimental study of the healing of fractures was conducted by D. E. Robertson and the writer and several somewhat puzzling points elucidated. It was found that ribs of dogs which had been fractured, and even ribs from which small segments had been completely removed, united rapidly and firmly in spite of constant movement of the fragments. This agrees with what we are accustomed to find clinically, although in adults non-union is a common result after resection of more than an inch of rib. It was observed, both in the animals and in clinical cases which were followed by successive *x*-ray examinations, that, after resection of the bone, the space filled in from the open ends of the fragments. The new bone appears first at the fractured surfaces and gradually spreads along the periosteal tube. After four or five weeks the space near the end of the fragment is filled with new bone of slightly greater thickness than the normal rib, while the middle portion of the space contains only a thin spindle of new bone. Ultimately this central portion thickens and the rib returns to its normal outline and structure.

In marked contrast to the results observed in the ribs were those seen after similar operations on the shaft of the radius. After simple transverse sections in which movement was allowed, as in the case of the ribs, non-union was the invariable result. This finding has been recorded also by Phemister and Hey Groves. Whenever, also, bony contact of the fragments was not secured, as after subperiosteal resection of half an inch or more of the shaft, union never occurred, in spite of the most perfect splinting. When, on the other hand, complete immobilization of fragments which were placed in contact was obtained, as by the application of plates of steel or bone, union occurred normally. When, also, in those cases in which subperiosteal resection of half an inch of the shaft was performed, if the ends of the fragments were comminuted and the space between them strewn with particles and slivers of bone, great osteoblastic activity occurred and union resulted in the same manner as it did in the resected ribs, provided always that immobilization was secured.

From these considerations, certain conclusions were deduced. It is evident that, in a general way, the long accepted principles of treatment which demand that the fragments be immobilized and placed in contact, are correct. It is also evident, however, that these principles are not always essential to union, as is seen in the fractured and resected ribs, for here the fragments are neither immobilized nor placed in actual contact. It has further been

shown that in fractures of the long bones, contact of the fragments is not an essential, provided comminution has occurred and the space is strewn with spicules of bone. It appears, in fact, that immobilization and contact are not the *sine qua non* of union of a fracture, but that the great essential to union is an adequate inflammatory reaction as evidenced by the proliferation and outpouring of osteoblasts. In the case of a rib or of any bone in a child this occurs rapidly and in abundance because the ends of the fragments are porous, because a large proportion of the bone is composed of cancellous tissue, and because there is a comparatively large supply of osteoblasts. In the case of the shaft of an adult long bone, the reaction is slow owing to the dense character of the bone and the comparative scarcity of osteoblasts. Thus is explained the contrast in the rate of repair in a simple transverse section such as is produced by an osteotome or saw and that which occurs in an oblique, fissured or comminuted fracture of a similar bone. In the former the reaction is slight owing to the mildness of the irritant and the remoteness and scarcity of the cells upon which repair must depend. In the latter the degree of irritation is greatly increased and, owing to the nature of the fracture, the channels by which osteoblasts can reach the region of the fracture are multiplied.

That these observations are not merely theoretical is forcibly demonstrated by a simple experiment in bone transplantation. If a small section of rib be removed subperiosteally and transplanted into the muscles of the back, and if a section of the compact tissue of the shaft of the radius be similarly treated, and the specimens recovered at the end of five weeks, the contrast in the changes which have occurred is remarkable. In the case of the rib the transplant is surrounded by myriads of proliferating osteoblasts, the old bone is covered with layers of new cancellous tissue, and the necrotic graft is permeated by a new circulation and is undergoing rapid absorption and replacement by osteoblasts which have invaded it along with the new formed blood-vessels In the case of the compact bone from the radius the transplant is much as it was at the time of the operation. On its surface are comparatively few osteoblasts and a small quantity of new formed bone, and but little progress has been made in the direction of absorption and replacement. If, now, before the transplantation of the compact bone to the muscles of the back, the graft be freely comminuted, the appearances after the lapse of five weeks are entirely different. Now the whole area is filled with proliferating osteoblasts, the

various particles of the transplant are cemented together by trabeculæ of new cancellous bone, and absorption and replacement are progressing much as in the case of the rib. The conclusion, therefore, is obvious, that the phenomenon of repair in bone is dependent on two chief factors, the degree of irritation to which the reparative cells in the neighbourhood are subjected and the freedom with which they are able to respond to this irritant.

With these observations in mind it is at once apparent that the principle involved in the operation of complete subperiosteal resection of the area of a gunshot fracture was wrong. We have already seen that the notion that the shaft would be restored by regeneration from the periosteum is based on no scientific evidence and we now see that the removal of the comminuted fragments destroys the very factor upon which the union of such fractures depends. Fortunately the defect in the method was recognized fairly early and a more conservative treatment adopted. In the latter years of the war the surgeons in the casualty clearing stations contented themselves with the excision of the wound in the soft parts, the removal of foreign bodies, and the removal of only those pieces of bone which were devoid of blood-supply and which would naturally become sequestra, should suppuration supervene.

With this form of treatment the numbers of cases of non-union were surprisingly few; so few, in fact, as to cause one to wonder if the old idea that sepsis is a potent cause of non-union, is actually true. Of nearly two thousand cases of septic compound fractures passing through the Granville Canadian Special Hospital in a period of eighteen months, only fifty could be found with non-union. A study of all these united and un-united fractures led to some interesting observations. It was noted that, when union had occurred, the area was surrounded by enormous quantities of callus, much in excess of that which develops about simple fractures. The same fact was noted also in the case of amputations which had become septic. Here it was common to find large callus spurs extending from the ends or sides of the amputated bones, in marked contrast to the clean appearance of aseptic amputations. The majority of these fractures and amputations still had sinuses leading to cavities and small sequestra.

The obvious conclusion from these observations is that septic infection, after the acute symptoms have subsided, is a powerful stimulant of osteogenesis. It would therefore seem probable that, unless other factors are introduced, septic compound fractures are more likely to unite than simple fractures. That this suggestion

has some element of truth in it can be readily shown by another simple experiment. If a compound fracture be produced in the radius of a dog and reasonably good fixation provided, and a mild septic infection produced by the introduction of attenuated staphylococci, union takes place rapidly and strongly with a copious production of cancellous new bone. It is evident, therefore, that the non-unions which have hitherto been attributed to sepsis are due to other factors than the subacute infection which persists after the initial sepsis has subsided.

To discover what really are the factors which determine that certain septic fractures do not unite, all the cases under treatment were carefully studied. It was found, in the majority of instances, that the ends of the fragments were not in contact. This was particularly the case in the humerus, when segments of bone had been shot away or removed by the subperiosteal method and the arm allowed to hang at the side, thus preventing the shortening necessary to bring the ends of the fragments in contact. It was also common in the bones of the forearm and leg when one bone only was injured. It was rare in the femur, for here the contraction of the powerful muscles produced sufficient shortening to close the gaps. A less common cause of non-union was the presence of necrosis of the whole of the end of one or both fragments, a condition which as effectively prevented contact of the living bone of the fragments as did resection of the fractured areas. Both in the cases in which segments of the shafts were lost and in those in which extensive necrosis had occurred, great efforts had been made by the living bone beyond the fracture to bridge over the gap. The appearance of spurs extending from the ends of the fragments directly into the space or around the outside of the sequestra was quite common and is to be explained in the same way as the formation of irregular spurs in septic amputation stumps. It is such appearances as these that have confirmed in many minds the erroneous belief that this new bone is growing from the periosteum.

Examination of these cases of non-union at operation showed that when segments of bone had been lost, the space was invariably filled with fibrous tissue into which ran irregular spicules of new bone from the ends of the fragments. When large sequestra were present, the space was filled with granulation tissue in a state of ulceration. In both cases the ends of the living bone of the fragments were covered with masses of spongy new bone and cartilage which would be most effective in producing union if this were not prevented by the factors described.

The treatment, therefore, of septic non-union is fairly clearly indicated. It consists of getting rid of those factors which are preventing the proper repair, that is, it consists in bringing the healthy ends of the fragments into close contact and in removing the sequestra which are obstructing the union. If this is thoroughly done, the fusion of the masses of callus on each of the fragments should be rapid and the union of the fracture assured. This plan was accordingly adopted in all suitable cases. Unfortunately, it is not applicable to all, as in some cases, such as in fractures of one of the bones of the forearm or leg, the amount of shortening necessary to obtain contact of the fragments is so great that marked deformity would result. But in the great majority, as in fractures of the humerus and femur, and of both bones of the forearm and leg, this method has proved itself applicable and has been very satisfactory. The operation consists of the free excision of the scar and sinuses, with a free opening down to the bone, as in an ordinary open operation on a simple fracture. All scar tissue, unhealthy granulations and sequestra are then removed, care being taken that no stripping of the periosteum occurs. The ends of the fragments, still covered and surrounded by spongy new bone, are brought together and, if necessary, fastened in position with an absorbable suture passed through drill holes. Sometimes it is wise to fit the fragments together by cutting slots in the end of one to receive the irregular points of the other. The wound is then closed at the extremities and the central portion packed with iodoform gauze. The parts are immobilized in a plaster of paris splint which is fenestrated for the dressings. (Figs. 1 and 2.)

After such an extensive operation in a known septic field, it is surprising how little acute inflammation arises. In the majority of cases the sutured portion of the wound heals by primary union and there is very little discharge from the drained area. This is probably due to an immunity to the infection developed since the time of the wound. In no case did serious inflammatory phenomena occur.

The results of these operations were most satisfactory. Union occurred with surprising rapidity, in many cases in half the time required after a simple fracture. It was not uncommon to find fair union of a fracture of the humerus two weeks after the operation. Of the cases operated on by this method, eighty per cent. resulted in good bony union within two months.

The importance of these results will be appreciated when one realizes how greatly the time of treatment is reduced. It has been

the usual plan of the surgeon, in these cases, to devote all his attention to getting rid of the infection, in the hope that by so doing union would result spontaneously. As this usually did not occur, even after the healing of the wound, some form of operative treatment, frequently the transplantation of bone, was undertaken after sufficient time for latent infection to disappear had elapsed. As all surgeons know, such operations are by no means free from risk, or certain of result. Often sepsis has defeated the object of the operation, or the great sclerosis of the ends of the fragments which develops during the six months or more which intervenes between the healing of the wound and the open operation, has caused a recurrence of the non-union. At its best such a plan keeps the patient under treatment for at least a year, and often more nearly two years. Contrast with this the result of operating while mild sepsis is still present and while the ends of the fragments are in the most favorable condition for union. In the latter case, union is firm within three months, and the time of treatment has been reduced by a year.

Before recommending that this plan of treatment be adopted in all cases of septic non-union a note of warning must be sounded in regard to the difficulties of the operation. Two chief difficulties present themselves, namely, the efficient splinting of the fragments, and the providing of sufficient access to the wound to allow of daily dressings. Some surgeons have attempted to get over these difficulties by applying strong metal plates at the time of the operation. While occasionally this plan has been successful in obtaining union, it has been my experience that such cases do not do nearly so well as if the foreign material is omitted. Many such patients came to us with the non-union persisting as before and with the metal plate loose in the callus. Several of these cases actually united as soon as the metal plate was removed. It became our opinion that foreign materials placed in a septic wound produced so great an irritation that the osteoblasts were kept constantly in an embryonic condition and were prevented from reverting to their adult function of bone production. We preferred, therefore, to exclude if possible, all foreign materials from the wound, and, if the tendency of the fragments to slip was so great as to demand some form of internal fixation, to depend on kangaroo sutures passed through drill holes. The greatest reliance, however, was placed on the external splints of plaster of paris. These were applied as a circular bandage but were reinforced by ropes of plaster so that wide areas could be excised for the dressings Sometimes, in spite of these precautions, the discharge for the first few days was so

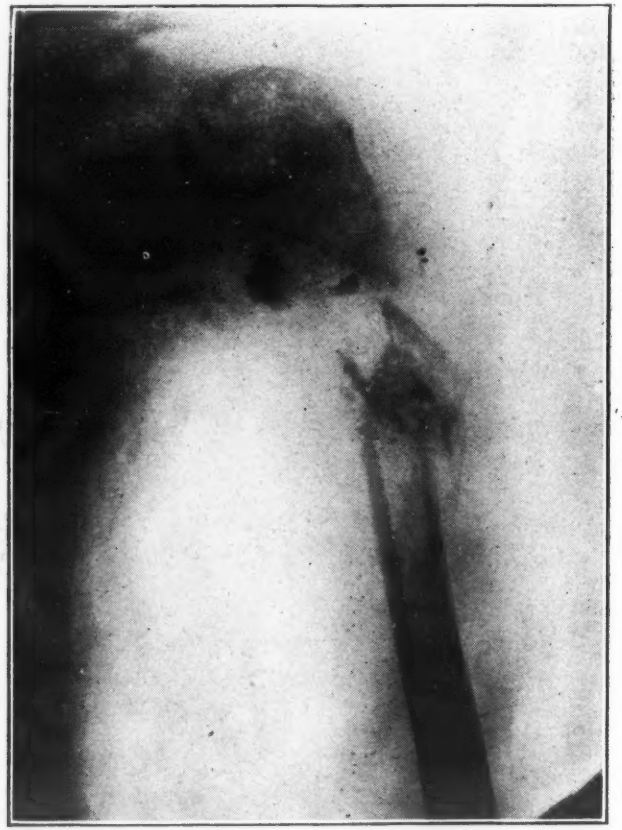

FIG. 1.—X-ray of compound, comminuted fracture of the humerus, taken four months after gunshot wound. It shows complete non-union, loss of substance of the shaft with separation of the fragments, and the presence of sequestra.

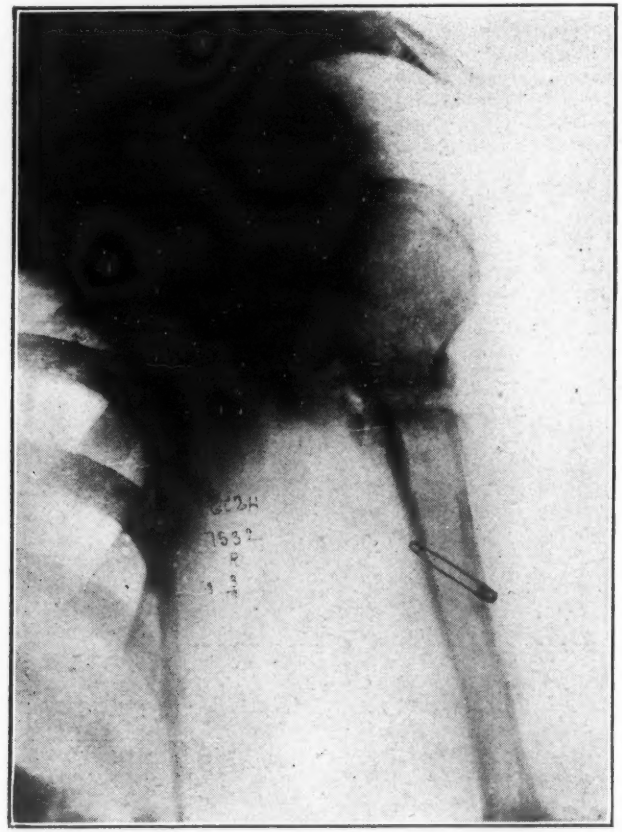

FIG. 2.—X-ray of same arm four months after operation in which scar and sinus were excised, the sequestra removed, and the fragments jammed together and fastened with a kangaroo tendon suture. The wound is now healed, the union of the fracture solid and the function of the arm normal. He has two inches shortening.

FIG 3.—X-ray of compound, comminuted fracture of tibia and fibula in which union has occurred in a very deformed position. The wound was still septic and several sequestra were still present.

FIG. 4.—X-ray of same fracture six weeks later. The wound has now completely healed and the fracture is again solidly united subsequent to an operation in which the scar and sinuses were excised, the sequestra removed, the edges of the cavities made shelving, and the union in the deformed position broken down by an osteotome driven through the callus.

profuse as to completely spoil the plaster. When this occurred the patient was again anæsthetized and a complete new splint applied.

One other point in relation to these septic compound fractures is worth recording. Many patients were admitted to hospital in whom such fractures had united in faulty position. Formerly it was the custom to devote one's attention to the elimination of infection and to the healing of the wound. Six months after final healing had occurred, some operative procedure was undertaken to correct the deformity. This method of treatment had the disadvantage that it was exceedingly wasteful of time and also that it was attended by considerable risk of non-union after the production of the new fracture for the straightening of the bone, owing to the sclerosis which occurs after the old septic infection has disappeared. When it was recognized, however, that the most favourable period for the healing of infected fractures is during the time that the subacute inflammation is still present, we did not hesitate to correct the deformities in these cases immediately, by driving a chisel through the new spongy bone at the site of union, and immediately straightening the limb. Care was taken that after the correction had been completed, actual contact of spongy new bone was maintained. All the cases treated in this manner united promptly in the corrected position, thus saving the patient a year or more of treatment and removing the uncertainty which always attends operations performed after healing of the original wound has occurred. (Figs. 3 and 4.)

In British Columbia vast magnesium sulphate deposits have recently been discovered at Basque. Subsequent examination by the provincial geologists has confirmed the discovery. The proximity of the deposit to the Canadian Pacific and the Canadian National railways makes it remarkable that they should have escaped the notice of scientists so long. Basque is about one hundred and ninety miles from Vancouver on the two transcontinental lines. The deposits are located at Epsom Spur about three miles from the station. Borings have been made and at a depth of forty feet the drill was still in epsom salt. If, at the outset, it had been announced that 21,000,000 tons of epsom salt had been found, the statement would have aroused much amusement, but careful examination by a number of reputable analysts bears out the fact that the claim is entirely conservative. A large plant is now in operation at Epsom Spur.

WOUNDS AND INFECTIONS OF THE KNEE JOINT

By Alfred T. Bazin, M.D.

Montreal General Hospital

SOME months ago I was approached by a surgeon of experience and asked to define the treatment of an infected knee joint. He stated that so many articles had appeared recommending such diverse procedures he was entirely at sea. Possibly he is not alone in his confusion, hence my excuse for bringing to your attention such a war-worn subject.

Furthermore, although severe wounding of the knee joint is comparatively rare in civil surgery, it is not an infrequent experience to meet with punctured wounds and with metastatic infections. As the associated infection, or potentialities for infection in wounding of the joint is the most important element affecting prognosis, a consideration of the subject is well worth while at all times.

I offer as authority for my conclusions:

1. The dissection, preparation and study, in association with Dr. L. J. Rhea, of a number of specimens removed by amputation or at post mortem shewing the effects of injury and infection of the knee joint. These studies were made prior to January 1st, 1918.

2. Personal observation and care of one hundred and ninety-five cases of penetrating wounds of the knee joint from January 1st to October 1st, 1918.

In this series there were two amputations and three deaths. Amputation was performed for:

(*a*) Massive gas gangrene of the leg due to a small shell fragment penetrating the calf muscles and overlooked among the multiple wounds from which the man suffered.

(*b*) Secondary hæmorrhage from popliteal artery in a through and through antero-posterior wound shattering the head of the tibia.

The three deaths were due to:

(*a*) Metastatic streptococcal meningitis on the eighth day.

Read before the Montreal Medico-Chirurgical Society. December, 1919.

(*b*) Massive broncho-pneumonia associated with severe shell wound of the left shoulder and comminution of the humerus, in addition to wounds of both knee joints.

(*c*) Streptococcal septicæmia terminating a case of wound of the left knee joint, compound fracture of the right humerus and tetanus.

One hundred and ninety cases were sent to England either completely healed with movement of flexion to at least 45°, or in splints, with the infection entirely under control, but requiring massage and other treatment for the restoration of function.

I regret that I cannot go into more detail in classifying these cases as to severity of injury to bone or the development of infection; the records are not yet available. Nor am I able to give you the end results of this series. No. 3 Canadian General Hospital was not an end hospital. We were forced to evacuate to England as soon as the journey could be made without serious detriment to the patient. Reports were received, however, regarding many cases sent across in the earlier months of the period and these reports were uniformly favourable.

To what can be attributed this marked improvement in results over those obtained in the earlier years of the war and in civil surgery preceding the war?

1. A general advance in the knowledge gained from the experience of the preceding years of the war.

2. Segregation of the knee cases in huts fitted with frames for suspension and extension. Cords, pulleys and counterpoises were all in readiness over each bed and it required but a few minutes to sling the limb into position after the patient had arrived from the operating room.

3. A specially trained staff of medical officers, nursing sisters and orderlies who exercised eternal vigilance in maintaining the correct position and detecting evidence of tracking abscess.

All cases of effusion into the joint, associated with wounding at or near the knee, were subjected to a routine examination. The exploring needle was introduced and some fluid withdrawn. Bloody or blood-stained fluid was interpreted as meaning a lesion of the synovial membrane. Accidental bleeding due to the needle is avoided by introducing the point of the needle into the space between the patella and trochlear surface of the femur. These surfaces are avascular, whereas a scratch of the synovial membrane lining the supra-patellar pouch may lead to considerable oozing and confuse the diagnosis.

Careful *x*-ray examination, antero-posterior and lateral, to determine the presence and position of foreign body, or the presence of a bone lesion and position of the fragments.

The operative treatment varied according to the conditions found.

With a through-and-through high velocity bullet wound, both exit and entrance seared dry and covered with a sterile scab and with only blood stained effusion in the joint, the limb was placed in suspension and extension; the joint aspirated as empty as was possible and 10 to 12 c.c. 2 per cent. formalin in glycerine injected. Aspiration was repeated as often as required to prevent tension in the joint, and at times a fresh injection of formalin-glycerine was employed.

When the bleeding into the joint amounted to a hæmarthrosis, the joint was opened by a para-patellar incision, the cavity thoroughly irrigated with normal saline to remove all clot, and then closure was effected in layers—synovial membrane, aponeurosis and skin. The wounds were excised and also closed in layers.

When the *x*-ray shewed foreign body or bone lesion, the joint was opened freely, foreign body and detached bone fragments removed, bone lesions thoroughly curetted or removed with the gouge, the cavity irrigated and the joint closed in layers. Attempt should be made by reflection and suture of the synovial membrane to render the joint tight and exclude from the cavity any bone lesion present. Of necessity, this cannot be satisfactorily done in lesions of the articular surfaces, and in such cases, hæmostasis must be accomplished before the joint is closed. It is imperative that the joint cavity be not allowed to refill with blood which affords a favourable nidus for the growth of any infective organism which may be present.

Hæmostasis may be effected by the use of hot swabs or by the application of flavine 1-1000 aqueous solution. It may even be necessary to pack the bone lesion with flavine gauze, apply a flavine dressing and wait twelve to twenty-four hours before closure.

In all operative procedures upon the knee joint, rough handling is not permissible; the synovial endothelium must not be bruised or abraded Hence, dry swabs should not be used, nor strong antiseptic solutions. Irrigation should be done with a soft rubber catheter; exploration with the moistened gloved finger. Dry dressings are applied, smoothly covered with an abundant amount of absorbent cotton entirely surrounding the limb, and bandaged firmly and evenly.

Thorough immobilization is then, in my opinion, an essential. This was obtained by the use of a Thomas knee splint with snugly fitting ring, bent at the knee to an angle of 30° from the straight, in which the limb was suspended by four-inch flannel strips passing from one lateral bar to the other and extending from the ring to within four inches of the malleoli. A Sinclair serrated wood foot-piece was used to support the foot and with lateral glued strips to the leg, afforded the means of tying the leg into the splint and allowing of extension by traction.

After the return of the patient to the ward, the limb was suspended with accurately counterpoised weights and six pounds of extension. This amount of traction is not with the idea of separating the joint surfaces, but for the purpose of steadying the lower end of the splint and to prevent reflex muscular twitchings, especially during light sleep.

Disturbance of the limb was further guarded against by padding the thigh and leg and applying broad gauze bandages over all; also by arranging the bed covers in such a way as to permit the injured limb to swing freely above them, protecting it from cold by its own wrappings.

The foot of the bed is raised eight to ten inches, not only to obtain counter-extension from the patient's body-weight, but to promote a rapid and easy return of circulation in the veins of the limb.

This detail of description may seem superfluous, but I know of no condition which requires more strict attention to detail. Not only must the patient be made comfortable, he must be kept comfortable, and daily inspection with correction of any alteration in position of the appliance is necessary to obtain results.

We now pass to the second phase.

Having done an operative mechanical cleansing, and having immobilized the limb to secure physical and functional rest to the joint, it is now necessary to prevent tension by frequent aspirations of the accumulating fluid.

Tension exerts an evil influence:

1. By interfering with the circulation of the cells of the synovial membrane.

2. By tearing out the sutures in the synovial membrane and spoiling the perfect closure which was effected at the time of operation.

It is well established that tissues in which the circulation is

active are well able to combat infection, whereas more or less ischemic tissues readily succumb.

If infection develops and the suture line has given way, the infection is no longer confined to the joint cavity, but spreads into the superficial tissues with the development of tracking abscess.

The use of formalin-glycerine or other antiseptics is optional. In my opinion, the aspiration alone suffices. Fresh fluids of bactericidal power are poured into the joint, and, being removed, make room for more. If formalin-glycerine be used, it is unwise to follow Murphy's original plan of forcibly filling the joint, but to employ Dr. J. M. Elder's modification of repeated injections of 5 to 10 c.c. If all goes well, smears and cultures from the successive aspirations show a rapidly decreasing number of bacteria, the joint refills more and more slowly, swelling and induration of the soft parts subside, temperature and pulse drop and in from five to eight days conditions are apparently normal.

But all cases do not proceed so favourably. In these the infection in the joint does not subside, and in spite of relief of tension by aspiration, the periarticular tissues become involved and tracking abscesses develop.

This is evidenced by rise of pulse and temperature and the detection of indurated and tender areas about the joint. Periarticular infection may arise in many ways:

(*a*) Along the track of the original wound.

(*b*) Along the track of the aspirating needle.

(*c*) As a lymphangitis, usually by absorption from an infected bone lesion in the joint.

(*d*) From the bursting of involved bursæ.

These last named deserve more than passing notice. There are two bursæ about the knee which normally communicate with the synovial cavity of the joint—one beneath the internal head of the gastrocnemius, and one which forms the sheath of the popliteus tendon. The gastrocnemius bursa communicates with the joint cavity where the lining membrane of the latter is reflected from the posterior capsular ligament on to the posterior articular surface of the inner condyle. The orifice is crescentic and is closed off in the extended position of the limb. Not only does this bursa lie between the gastrocnemius head and the capsule covering the internal condyle, but it is reflected around the tendon and extends between it and the superimposed tendon of the semi-membranosus muscle.

You will thus realize that a suppurative process in this bursa

may lead to an abscess tracking into the calf along the deep aspect of the gastrocnemius, or up into the thigh along the inner hamstring.

The sheath of the popliteus tendon accompanies that tendon as it emerges from the capsule of the external aspect of the joint and passes downward behind the superior tibio-fibular joint to the attachment of the muscle on the triangular surface of the tibia. Abscess resulting from involvement of this bursa may be superficial to the muscle and point in the lower portion of the popliteal space, or lie between the muscle and the tibia and be very difficult of detection and of approach.

Another important complication which may be associated with suppuration of the popliteus bursa is infection of the superior tibio-fibular joint. In 12 per cent. of all joints examined there is found an aperture in the posterior ligament of this joint, through which the synovial membrane communicates with the sheath of the popliteus tendon. The only successful treatment of this complication is sub-periosteal resection of the head of the fibula, and free drainage of the exposed joint cavity.

As soon as an infected knee shows evidence of periarticular or tracking abscess, the treatment must undergo a radical change. No longer can the knee be treated as a closed joint; it must be opened and drained.

Drainage is procured by making oblique incisions along the lateral margins of the supra-patellar pouch. These incisions run from the level of the middle of the patella to the level of the uppermost portion of the supra-patellar pouch. They are widely separated below, but converge above. The skin is incised; then the fibres of the vasti which here run toward the centre of the leg and are thus divided transversely; then the synovial membrane is nicked, a director passed and the incision completed on this as a guide.

Some vessels in the muscle require ligature. The gloved finger explores to determine that no pocket o the supra-patellar pouch remains above the upper limit of the incisions. No drainage material is inserted; fluffy gauze is applied to the incisions and covered with dry dressing. The cutting of the vasti muscles transversely to the direction of the fibres tends to separate the edges of the wound and there is no tendency for these incisions to close until the need for them is passed.

This method is quite at variance with former ideas of knee drainage in which drainage material was carried across the joint

above and below the patella and also posteriorly to drain the pouches of the condyles. The use of drainage material cannot be too strongly condemned. It does no good and does much harm in that it causes erosion of the synovial lining with resultant strong fibrous adhesions.

This operation, as also the opening of tracking abscesses, is done under gas anæsthesia without removing the patient from his bed, or even disturbing the position of the limb. In fact, the abscesses can be more effectively drained if the incisions are planned with the limb in the position of immobilization in which it will afterwards be maintained.

This covers in a general way the plan adopted. For individual cases, modifications must be instituted to discuss which would make this already lengthy paper altogether too ponderous.

We will next consider the third and last phase, viz.: restoration of function.

Function of the knee joint requires free painless *movement* to the normal extent and *stability*. Movements are restricted by:

(*a*) Bony union of the joint surfaces where the articular cartilage has been eroded.

(*b*) Fibrous adhesions in the joint cavity.

(*c*) Thickening of periarticular structures.

(d) Adhesions and fibrosis of the muscles, especially of the quadriceps extensor.

Stability is effected by:

(*a*) Prolonged distension leading to relaxation of the ligaments.

(*b*) Loss of tone in the muscles which operate the joint.

(*c*) Loss from trauma or at operation of any considerable portion of the bearing surface of the articulation.

This last may require the use of permanent apparatus.

As stated in my introductory remarks, my experience with this phase of treatment is extremely limited, but sufficient to impress two cardinal rules, *i.e.*, that mobilization must not be commenced too soon, and that it must not be withheld for too long.

In cases which responded to "closed" treatment, it was our custom to commence passive motion of the knee on the fifth day of normal temperature and apparent normal conditions in and about the joint. The limb was removed from the splint. A heavy padding of absorbent cotton surrounded the knee and was held in place with a broad gauze circular bandage firmly applied. Daily, the extent of movement was increased and it was usual to get flexion

to 45° from the straight in from eight to ten days. The patient was then shipped to England with the limb in a splint to guard against injury and strain during the journey.

In quite a number, especially if the infection had been severe, this early mobilization caused a lighting up of the infection, requiring a further period of immobilization and active treatment. In a few this recrudescence was so severe as to result in tracking abscess and the necessity of open drainage in joints which had apparently "cured" with a short period of "closed" treatment.

I am therefore strongly opposed to attempting Willems' method of active mobilization in the presence of acute infection.

On the other hand, a stiff knee is a tremendous disability, and unduly prolonged immobilization will require months of treatment to overcome the effects produced thereby.

In conclusion, I would like, if possible, to acknowledge aid which I have received from many sources, but the list would be a formidable one, including the consulting surgeons and surgical staff of all the hospitals in the area. But I cannot omit my commanding officers, Colonels J. M. Elder and Lorne Drum, and the medical, nursing and orderly staffs of ward "A", No. 3 Canadian General Hospital, Boulogne.

A SCHEME for the extension of child hygiene welfare work has recently been laid before the city council of Vancouver by Dr. D. T. Underhill. He suggests that the health of all children of the city should be supervised from birth to the age of six years by the child hygiene division of the civic health department, after which age they will be placed under the school health department. The employment of three additional nurses will be required, two to work under the supervision of the school medical branch, and one under the Victorian Order Their combined efforts would be directed to the carrying out the provisions of the Infants' Protection Act. This will include the examination and registration of all houses where children are taken or hire under seven years of age; attendance at clinics and subsequent supervision of all children discharged from the Infants' Hospital and Crêche, and of children taken for adoption. The Victorian Order nurse would attend the work of the community clinics and take charge of prenatal work. The importance of giving more attention to the pre-natal work was emphasized, the medical officer stating that one out of each nineteen births during 1919 was stillborn.

CANCER OF THE UTERUS WITH SPECIAL REFERENCE TO DIAGNOSIS

By G. Stewart Cameron, M.D.

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IN bringing the question of cancer of the uterus before the attention of this meeting, and particularly of this section, I do not do so with the view of introducing any new material on the subject, but rather to reiterate what we already know of a disease that takes as its toll one woman out of eight who has passed the age of thirty-five.

To my mind the keystone of the whole treatment lies in the early diagnosis, for once our profession is thoroughly seized with the importance of certain comparatively simple signs, just so soon will the early detection of this trouble become possible, and once the early diagnosis is made, it will be an easy matter to secure the proper surgical treatment. We may go further and say that not only should our profession at large be alive to these early symptoms, but it should be their duty to instruct their patients that neglect of attention to these signs will inevitably lead, in far too many cases, to a fatal termination, for once the disease is established the possibility of successful surgical interference is extremely remote. I think, therefore, that every medical man should be a missionary among his female patients instructing them in a sound, rational way whenever the opportunity presents itself.

I can well remember a few years ago, when a student in medicine we were instructed in the various symptoms of cancer, such as wasting, cachexia, anorexia and other symptoms, which to-day we all recognize as among the terminal evidences of this trouble. I stated, we all recognize, but I am sorry to say that sometimes we find that there still persists among some members of our profession a desire to cling to these advanced signs, and not appreciate the earlier symptoms.

Anatomy. In regard to the anatomy of the pelvic organs, I have only a word to say, and that is with reference to the lymphatic distribution. The uterus, being developed in the abdomen, and

subsequently descended into the pelvis, retains its connection with the abdomen through the lymphatic and circulatory systems. The lymphatic drainage of the upper segment of the vagina and cervix is through the lymphatics in the base of the broad ligament, up through the iliac glands to the lumbar glands encircling the abdominal aorta. The glands of the uterine body and the tubes drain into the iliac glands and thence upward in the same way. I consider it important to mention this as it shows the route of the lymphatic advancement directly upward into the abdomen. Through this arrangement the disease rapidly passes beyond our control, and the opportunities for successful operation is entirely eliminated.

Age. We have been taught in considering diseases to regard age as a particular factor and while this has to a considerable extent a bearing in many instances, when we come to consider malignancy it would be well to disregard it entirely as there is no cancer age, the disease having appeared in almost all periods of life. There are certain broad divisions which we might make in saying that cancer of the cervix is more generally found in women at or before the climacteric, whereas cancer of the fundus is more frequently found in patients past the menopause Again we might say that the cervical type is more frequently found in multiparous women, while that of the fundus is commoner in the nulliparous.

Heredity. Heredity should not prejudice us in our judgement. Because the patient's forebears may have died of cancer it does not follow that she must have cancer, and, on the other hand, a clear family history should not weigh against highly suspicious symptoms.

Hæmorrhage. Hæmorrhage is perhaps the earliest noticeable sign. When a patient presents herself complaining of loss of blood between periods, we should forget the age, and whether she is married or single, and bend our energies to prove that we are not dealing with a case of cancer. The bleeding of early cancer is usually irregular and inter-menstrual and is often produced on the slightest exertion. It may be very slight and the patient pay little attention to it, but careful questioning will usually show that it has gradually increased. If the patient is past the climacteric and comes complaining of hæmorrhage, one or more years afterwards we should be extremely suspicious that we are dealing with malignancy, and again prove to our own satisfaction that this is not present Patients may appear complaining of hæmorrhage which they say is from the pelvic organs, and one may be led astray

by accepting their simple statement. Again, we should be suspicious and make a thorough investigation An instance of this occurred not long ago where a patient complained of bleeding from the bladder; subsequent examination, however, under anæsthesia, showed the bladder to be perfectly healthy, but a beginning of cancer of the body of the uterus to be present. There are certain cases in which examination shows undoubted fibromyomata present and in view of the fact that we know that a fair percentage of these cases have cancerous involvement as well, it would be better to get microscopical findings, and know positively what changes may be going on in the endometronium.

Discharge. The discharge at first will be leucorrhœal in character, perhaps more profuse than usual, but many of these patients having had lacerated cervices with more or less cervicitis, one cannot say that the early discharge is at all characteristic of cancer; as the ulceration progresses, however, the discharge becomes thinner and watery in character, more profuse, oftentmes brownish in colour owing to admixture of blood. Still later, when invasion by bacteria has taken place the discharge takes on that disagreeable fetid odour.

Pain. Pain is not marked. All cancer is distinguishable by its absence in early stages, so that pain as an evidence in this locality must be set aside Later on, when the disease has gained considerable headway, and we get eroson of and pressure on the nervous structures, pain will come into evidence

Emaciation. Loss of weight, which we have also associated with cancer, is one of the late symptoms; in fact, I have often been struck with the fat, healthy appearance of the patient, and subsequently found that she had a well marked malignant invasion, so we must not be led astray by the apparently healthy appearance of our patient.

Examination. Examination in the early cases may frequently give little positive evidence. Histologically, we know that the disease begins in the squamous epithelium on the outside of the cervix, or in the columnar cells somewhere in the canal. If then we find ulceration which has hardened and friable edges, and which bleeds easily, we should at once place the case in the more than doubtful class, and proceed to get microscopical findings. On the other hand, if the disease has begun in the canal we may neither see nor feel anything, or if the cancer has begun in the body of the uterus, the cervix will have a perfectly healthy appearance. This should not satisfy us by any means. I think we are quite justified in dilating the cervix and making as thorough examination of the

canal and body as possible, and to do this careful methodical curettage of every interior part is demanded. These scrapings should be washed, put into 10 per cent. formula, and submitted at once to a competent pathologist. The uterus should be normal in size, pretty freely moveable and without any increased tenderness.

The loss of blood per vaginam during the child-bearing period of life is a normal procedure, but any deviation from the established menstruation must have some cause behind it and it might be well for a moment to briefly consider some of these causes.

1st. *Abortion.* There will be a history of one or more missed periods with some of the other symptoms of pregnancy. These, followed with free loss of blood and characteristic pain will pretty well establish the cause.

2nd. *Ectopic Gestation.* Again one or more missed periods with other evidences of pregnancy. The discharge is red or brownish red, irregular, and oftentimes mixed with shreds of decidua. Examination will reveal a soft tumour in close apposition to the uterus, but distinct from it.

3rd. *Post-puerperal Hæmorrhage.* Either after full-term, or, more frequently, after an interrupted pregnancy. Here the bleeding may be fairly free with no pain. Examination will show a sub-involuted uterus, and fairly dilated os with blood coming from the body. Examination of the interior will usually show retained portions of placenta or a beginning chorion epithelioma.

4th. *Uterine or Tubal Infections.* There is usually a history of a previous pregnancy or an unusual discharge. Bleeding is that of prolonged periods, with temperature usually present at some time of day. Examination will show a painful tender mass in the pelvis closely related to the uterus.

5th. *Fibro-myomata.* The history of the bleeding here is usually that of the menstrual periods being gradually prolonged, and the flow noticeably increased. Examination will show an irregular walled uterus, hard knobs being present, or else there is evidence of the polypoid form on the inside.

6th. *Hæmorrhagic Endometritis.* This again shows increased flow, and frequency of periods, and may prove very doubtful until careful examination of the scrapings has been made.

7th. *Fibrosis Uteri.* The hæmorrhage is at this period profuse and much prolonged.

In conclusion let me say that any change from the normal in the loss of blood should put us on our guard. We should take a systematic history of our patient and insist on a careful and thorough examination under anæsthesia, if necessary.

THE CAUSES OF DEATH IN MEN WHO DIED FROM GUNSHOT WOUNDS OF THE ABDOMEN

By H. E. Clutterbuck, F.R.C.S. (Edin.)

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IT is no my purpose to devote this paper to the rather broad subj ct of abdominal injuries. That title was given on the pur of the moment, so it seemed to me advisabe to confine myself to some phase of such a large matter So I decided to restrict myself, in the main at least, to reviewing the results of autopsies on men who died from gunshot wounds of the abdomen, the greater number of whom were submitted to operation It is always a temptation to speak of one's successes and I had my share, but I know how helpful it was to me to review at autopsy some of these failures, if we may so designate all those who die.

My first experience with gunshot wounds of the abdomen was early in the war at Boulogne, a base which in a broad way was doing the work which later in the campaign was done, very properly, by the clearing stations. I was over a year there and I do not remember one single admission to the hospital of an abdomen operated up the line. But I do remember about half a dozen cases admitted to my own ward of abdominal wounds three to four days old. Some of them we opened only to find a hopeless condition, multiple holes of the intestine, with as many loosely walled off abscesses and intestinal content collections, a condition impossible to drain. They all died. It soon was realized that operation in these cases must be done at clearing stations and early in 1916 I joined a casualty clearing station and began the abdominal work, the facilities for doing which were being steadily improved by the army medical service and continued to be to the end of the war.

The statistics of the recoveries varied, they probably averaged about 50 per cent. Those who saw the cases know how hopeless would have been the prognosis without operation in the most of those who did recover. During all the year 1916 and early in 1917, we

endeavoured to do post mortems on those who died from gas poisoning, chest wounds, abdominal wounds, head wounds, etc. Later in the war, times were more strenuous and there was not much time for such examinations but those made at the time referred to disclosed much to me which was useful in those after years. During the period I am reviewing our greatest drawback was in not having an *x*-ray installation. That was remedied during the last half of the war. Otherwise our operating equipment was fair, we possessed the essentials, but not the frills. As a matter of perhaps general interest I might cite one case as a type of the very grave and hopeless cases so commonly admitted. It is an example of the complicated nature of the abdominal injuries.

Rifleman P., 8th R.I.R., wounded 11 p.m., October 1st; admitted 4.30 p.m., October 2nd; died 10.30 a.m., October 2nd. He complained of great abdominal pain, the pulse was 112 of very poor quality. It steadily increased in rate, and failed in quality. He had a wound over the cæcum and this part of the colon was prolapsed through the hole Examination after death showed that the missile had made a wound just internal to anterior superior spine about 2½ inches long through which the cæcum was protruding and some blood trickling. On body section the abdomen was found to contain much blood, also a large hæmorrhage posterior to peritoneum on the right side. The missile made a hole about 2 inches long in cæcum, and about 5 inches higher up had passed through the peritoneal reflection of the ascending colon, thence it entered the right kidney completely pulping it, then made a long laceration in the under side of the right lobe of the liver about 8 inches long and 1 inch deep. It then penetrated into the tissues of the back and was found lodged between the necks of the tenth and eleventh ribs.

In those men operated upon who died, dissolution took place either during the first twelve or sixteen hours from hæmorrhage and shock or at the end of four or five days or at a much more remote period, and then usually as the result of some complication. I shall make further reference to these two latter groups.

Certain questions were always in my mind before such an examination—would we find any lesions missed, would the sutured area have leaked, what state would the peritoneum be in? for I thought surely peritonitis would be often encountered.

It was my misfortune on several occasions to fail to find all the holes. I may say they were very small ones and it did not appear that their unsutured state had made any difference. A case

is as follows: The injuries which I repaired the same day he was wounded were as follows—two holes in cæcum, three large holes in lower il um with involvement of the associated mesentery seriously, 6 inches excised and end to end anastomosis done, eight scattered holes in the lower jejunum, with a small piece of metal sticking in one. All holes repaired with fine silk in two layers, the inner including all the coats and an outer Lembert continuous suture. He died on the fourth day the clinical picture of obstruction. On body section intestines glossy, moderate distension, very great distension of the duodenum. In the upper jejunum there are two small holes which show no remains of any suturing. All the others do and are sound, including the resection and cæcum wounds. At some of the sutured areas there is definite intestinal accumulation, not very great but present. The man died from paralytic ilius and in men dying at about that period we found this to be the most common cause of death. All surgeons had the same difficulty. Opinion varied as to whether it was a persistence of the paralysis on either side of the lesion or the interruption of Auerbach's plexus preventing the transmission of the peristaltic wave. At early operation, that is say within the first twelve hours, one almost invariably found an intestine in which there was complete inhibition of peristalsis I have often seen the small intestine cut completely across and there was not even with handling any evidence of contamination from the gaping ends, and of course the same was true of the lesser perforations. The greater the number of lesions the less the likelihood of peritoneal contamination. Therein lay both the man's safety and his danger. I speak only of the small intestine. In the colon, owing to its lax wall, leakage of its contents occurred fairly early, but its relatively fixed position, excluding the transverse colon, favoured walling off of infection. I could cite many other cases in which all the lesions were found sound with a distended gut above a resection or the grosser lacerations and a collapsed gut below. We tried doing a jejunostomy in several cases but I personally had not a successful case. Some few successful cases of short circuiting into the transverse colon were reported.

I sometimes wondered if a much wider resection would have given better results. The question was also raised by Colonel Richards if it would not be wise, if a second operation were necessary, to resect the area of injury plus that intestine injured by the acute obstruction. If a second intervention is necessary, the difficult thing is to choose a time before the damage is irreparable.

In regard to the failure to find all the injuries I am sure the

only way to avoid that, or reduce its possibility, is to operate through an adequate incision. A small opening has no place in the surgery of the traumatized abdomen and then the search had better be undertaken after a settled and ordered plan. I started at the ileccæcal junction, searched the whole of the small intestine, marking with gauze sponges lightly clamped over the damaged knuckle of gut, the injuries as I came to them. The transverse colon was searched at the same time. Then I began repairing when I knew what I had to do. A large incision permits examination without really dragging or bringing the gut outside so that there is much less shock from the necessary manipulations. I have not one single autopsy record of a man whose abdomen presented the evidences of peritonitis as presence of purulent fluid, recent lymph or adhesions and so on, operated on during the early hours following injury. I do not mean to say that we did not too frequently see peritonitis. After the first stages of a battle when the casualties were longer out and later in getting in, we had many men who died as a result of it. On the first day of the first battle of Cambrai, I had seven gunshot abdomens, six of whom recovered, the seventh's injuries were too severe for recovery, but later the results for the reason given were not so favourable. All these abdomens contained blood, many of them much blood. The bleeding was often from a small vessel in the mesentery and quite frequently from a small vessel in the edge of some intestinal wound. This was so because in such bleeding there is little tendency towards spontaneous arrest and the peritoneal space is great.

In regard to the matter of peritonitis, it did not occur because of the lack of peritoneal soiling and because in no case had the suturing failed. It was indeed a matter of some difficulty to find the repaired places so rapidly did gluing of the apposed surfaces take place.

Here is one case in which there was an intraperitoneal wound of the bladder. The wall of his viscus had been struck a glancing blow as the bullet travelled from behind forward This hole was difficult to get at, it was so low down but it was sutured with catgut in two layers. There were many intestinal holes and one group necessitated a resection.

He died on the fifth day with evidences of small bowel obstruction. We never succeeded in getting a satisfactory bowel movement. He was catheterized at regular intervals. The autopsy report of the abdomen was as follows: "Peritoneum glossy, a very small amount of bloody fluid in the recto-vesical pouch which smells

of urine. There are no adhesions or lymph over any part of the intestinal coils All the intestinal lesions are sound. The resection was slit up and is sound but there is a considerable lump of œdema all around the anastomosis ring. The bladder m.m. shows an intense cystitis, is empty and contracted to about the size of a golf ball. One stitch appears on the mucous surface. The hole admits a probe and does not appear to have held completely. As a general thing, intraperitoneal wounds of the bladder healed without incident.

In regard to the lump of œdema noted at the site of the anastomosis it caused me to adopt one farther step in the technique of the coupling operation. In order to reduce the amount of tissue turned in, I began to cut away what appears to be the almost redundant and pouting membrane of the intestinal ends before commencing the suturing. Mr. John Fraser, of Edinburgh, in experimental couplings on the intestines of Belgian hares, had found that the animals did not have obstruction when he did this The ring of apposed tissue is certainly less, and I thought my results were better after I adopted it. I also adopted the manœuvre of emptying the whole upper segment through the anastomosis ring and believe it contributed to better results.

I have said enough to indicate how always present was this question of intestinal paralysis. Some surgeons believed it occurred less frequently after the side to side operation, because in lateral operation the coupling is made through fresh and undamaged tissue. Acting on this belief, so good a surgeon as Mr. John Fraser usually performed this type of operation in preference to the end to end coupling. Later in his operating experience in France he held less strongly to this view. My own experience did not persuade me that, considering everything, extra time chiefly, that the results were any better than with the simple operation. Here is one case where I tried this operation. The patient was operated on about twelve hours after injury. His abdomen was hard and very sensitive. At operation the abdomen was found full of blood. The small bowel and mesentery contained two sets of holes, one near the lower end of the ilium and involving with its mesentery about eight inches and another also in small bowel, on the opposite side of the abdomen and with free hæmorrhage proceeding from a torn vessel in the mesentery. In both areas the holes were large and the bruising sev re and extensive. There was slight intestinal extravasation. I did a double resection and a side to side anastomosis. He died on the sixth day without having had a proper

bowel movement. At the autopsy the stomach and bowel down to the first anastomosis were found much distended. Both couplings were in good state. There was no peritonitis. The bowel below the upper ana tomosis was not distended.

When a great deal of any one kind of work is being done there is a natural sort of tendency to routine methods and in this conconnection I wish to make reference to what early n the war was an almost general practice. I refer to the employment of normal saline for copious irrigation of the peritoneum and the fairly general use of drainage into the pevlis The early effect upon my mind after seeing so many of these abdomens after death was to practically give up washing out the cavity. The early feeling was that the danger of infection in the presence of so much blood and wounds of the hollow viscera rendered it safer to carry out both procedures. But I soon began to practise a careful systematic sponging out of the cavity and also gave up in practically all the early cases the practise of drainage other than in a wound track or such as locally to the side of the colon where it had been opened w th some local soiling. Experience abundantly showed that in the early stage of these cases sponging out and closure without drainage was safe and advisable.

I have previously referred to a group of cases in whom death occurs from some condition which results from the state of lowered resistance, in which the patient is, following his wound, exposure and operation. During the winter time, especially most of the men had, when admitted, some degree of tracheitis and loose bronchitis, and a certain number developed a purulent bronchitis or bronchopneumonia. One case which I was very sorry to lose and who died on the fifteenth post-operat ve day was as follows:

Private W., 10th Royal Warwicks, wounded 5.30 a.m., September 1st, operated 11 a.m. same day. He was a strong ruddy looking man. Pulse rate of 90 and of good quality. The abdomen was rigid and sensitive but subjective pain was not complained of. He had two rather large holes in stomach with a large collection of blood in the lesser sac and also in stomach cavity When wounded, stomach was empty. The missile then passed into right lobe of liver. I could not feel it, and before operation, having no *x*-ray, could not locate it. At the close of operation his pulse was 112. At the end of the third day pulse was 98·4 and bowels had acted satisfactorily. On fifth day he showed slight cyanosis and had a catchy respiration. Both lungs in their lower lobes presented wide involvement on physical examination during the following days.

He died after steady failure on the fifteenth day. The autopsy well illustrates the hopelessness of this complication.

Both pleura contained a small amount (four and six ounces) turbid bloody fluid. Recent adhesions base to near apex on left side; pericardium normal.

Both lungs contained many large and small abscesses, one in left lung as large as a tangerine orange. There was some pus in right tonsil. In cortex of left kidney two small abscesses size of a large pea. In the abdomen the stomach was found well healed. The piece of metal was found about five inches deep in liver. The walls of the track were yellowish and ragged looking but there was no penetration of this into the liver substance.

And now I want to close this paper by reference to one case of stomach wound, because it raises an important matter in regard to such wounds. In 1916 Colonel Elliott reported a number of cases of men with stomach perforations from gastric hæmorrhage, consequent upon erosion of blood vessels by the gastric juice where the wound holes were near to large vessels. The autopsy reports were given. These cases illustrate the possibility of the formation of a traumatic gastric ulcer. My case was a very interesting one. He was a soldier of the 101st Battalion, A.I.F. A bullet entered the right chest in nipple line about the sixth rib and emerged in left side of abdomen, high up and about mid-axillary line. He was spitting blood and had the catchy breathing of the chest cases. At the operation there was found (1) much free blood in peritoneum; (2) small hole in diaphragm; (3) laceration edge of left lobe of liver; (4) two rather large holes in anterior wall of stomach about three-quarter inch apart and about half way between the curvatures and in body portion. Posterior wall uninjured. The usual repair was carried out. He had a very stormy time for three or four days, after which the abdominal functions began returning to normal.

About the sixth day there were the physical signs of a large right pleural collection and an exploring needle drew away a sample of opaque blood tinged fluid which was found to contain many pneumococci, a few diphtheroid bacilli and an unidentified organism. The pleura was later drained by a rib resection. During the second week he began complaining of severe epigastric pain on swallowing any food and even water distressed him. We had great difficulty in nourishing him so great was his discomfort. He showed a certain tendency to improvement and I sent him to the base during the third week, with full notes and a request to hear further about him. I hoped he might fall under Colonel Elliott's eye, and

curiously he did, and later I had a letter from Colonel Elliott in which he says:

"The interesting point to me was that he complained of symptoms which in civil life would have led one without hesitation to the diagnosis of gastric ulcer. No hæmorrhage, but pain with all solid food. He was dieted, and now has risen to chicken without pain. There is no danger of hæmorrhage, because you found that the opening was on the anterior wall of the stomach, where there are no big vessels. I do not know whether internal silk ligatures contributed to the formation of this traumatic gastric ulcer. I wrote a short paper on this subject in the *British Medical Journal* of April 8th, 1916.

"He is doing well now, and I expect that he will soon be sent to England."

I later heard from England that he was going to New Zealand and that report was some months later.

The possible occurrence of traumatic gastric ulcer after a wound of the stomach indicates the care we should employ to give a diet which will tend to lessen as much as possible the outpouring of gastric juice during the early post-operative period.

In concluding this paper I ask your tolerance for telling the story of how we tried to solve the problems of this type of abdominal injury. They constantly occur in civil practise and so may not for that reason be without interest here.

It is a matter of interest that three Canadian physicians are in charge of relief work in the near east. Dr. F. W. MacCallum, of Kingston, Ontario, is the chief medical executive at Constantinople; Dr. J. W. McNaughton, of Dominion, Glengarry County, is in charge of the relief work in the Smyrna region, and Dr. Nesbitt Chambers, of Woodstock, Ontario, is directing the work in the villages around Adana, Cilicia. So far Dr. Chambers' unit added to Dr. McNaughton's area numbers 45,000 orphans and refugees, but Dr. MacCallum in a recent cable hopes to concentrate on approximately 100,000.

CERTAIN BACTERIOLOGICAL AND SEROLOGICAL ASPECTS OF EPIDEMIC INFLUENZA

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AND

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THOSE contributing the different papers in the above symposium were requested to limit their remarks to a ten-minute period of time. This necessitated a general summary and prohibited detailed reference to individual workers and their results.

On the outbreak of the epidemic of influenza early in the autumn, the research division of the Connaught Antitoxin Laboratories of the University of Toronto proposed to the army medical authorities that a comprehensive research should be started at once, offered to undertake this and provide the necessary equipment, and direction of the work. The Army Medical Corps agreed to this and after authority was obtained from Ottawa detailed Captain Donald Fraser for this purpose. In the protocol of experiments submitted, we suggested that volunteers, who would submit to the inoculation of filtrates prepared from the body fluids of typical cases, be asked for.

This was not done; unfortunately we think, as in the two reports noted below in which volunteers were injected with filtrates, the results are not in agreement.

The experiments conducted in the Connaught Antitoxin Laboratories and referred to in this paper are given in greater detail in the appendix.

From the standpoint of ætiology, the recent epidemic of influenza—possibly one might say the present epidemic—still remains without any accepted solution. It has existed for many months and has been the cause, so it is reported, of greater mortality than the war. At no time has the medical profession been in anything

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From the symposium of epidemic influenza presented to the Ontario Medical Association, May 28th, 1918.

like the same state of organization, yet this disease was allowed to rage for many months with but a fraction of the experimental endeavour that has been devoted to many less devastating conditions. The reasons for this are no doubt complicated, but fundamentally, to my mind, it is due to a lack of realization on the part of those in executive authority in the different medical organizations of the importance of meeting such a plague by adequate research.

The bacteriological findings from swabs of the nasopharyngeal membranes, from the bronchial secretions and from the pulmonary tissue at post mortem have varied considerably as reported by different investigators. In this brief review it is felt that the following summary is sufficient:

1. The presence of *Bacillus influenzæ* has been recorded in over 75 per cent. of the cases reported upon by certain investigators, and in some cases in pure culture.

2. The evidence is against 100 per cent. presence of the *Bacillus influenzæ*, even when one takes into account failures of detection because of faulty cultural methods.

3. So far the identification of the *Bacillus influenzæ* recovered from cases of the influenza has been made upon cultural and morphological grounds. As yet it has not been proven whether or not the *Bacillus influenzæ* has distinct types that can be shown by serological methods and until this is settled we will not have satisfactory methods of identification. Certainly identification on cultural and morphological grounds only are not sufficient. It has been shown by Cohen and Fitzgerald[1] that the *Bacillus influenzæ* can be differentiated by the agglutination reaction from such distinct hæmophytic micro-organisms as the bacillus of septic cerebrospinal meningitis, when anti-serum was prepared from fixed types.

4. Associated with the *Bacillus influenzæ* or alone, most observers have reported the presence of the ordinary species of bacteria such as are found in outbreaks of pneumonic infections, viz., strains of the streptococci, diplococcus of pneumonia, staphylocci, M. catarrhalis, etc.

5. No definite species of micro-organism can be regarded as having been proven to be the ætiological agent.

A few reports have appeared in the literature on investigation undertaken to determine whether agglutinins and fixation antibodies to *Bacillus influenzæ* are found in the sera of patients suffering from the disease or the sera of convalescents. Spooner, Scott and Heath[2] reported positive agglutination results to a high titre

with both pooled cultures and single strains; in their hands the titre apparently increased during the first few weeks after recovery.

Our own results with agglutination tests brought to light certain features which as far as we are aware have not been reported and which may be summarized as follows:

1. Between November 25th and December 6th, twenty-nine sera from patients who had recovered from typical attacks were tested for agglutinins to sixteen different strains of *Bacillus influenzæ* and four pooled emulsions from certain of these strains.

2. Of these sera a few showed no agglutination to all strains. Thus case 19 showed no agglutination to fourteen strains and gave but doubtful results in low dilutions to four.

3. Conversely, certain sera were strongly positive to all or nearly all strains. For example, case 16 was positive in the eighth or ninth dilution to fifteen different strains and only once fell as low as the fourth dilution. (These dilutions are shown in the appendix, Table I.)

4. The agglutinins which had been demonstrable in high dilution of the fresh serum rapidly disappeared, nor were they demonstrable at this later date in freshly drawn blood from the same patient.

Especially in the early part of the epidemic it was felt that the presence of the *Bacillus influenzæ* might not be demonstrated through lack of suitable methods, in which case serological tests might establish an ætiological relationship between the disease and this organism.

No such relationship has been established on either bacteriological or immunological grounds (and on clinical grounds a single ætiological agent for all cases is demanded). Undoubtedly, no matter what agent is the cause of the disease, a concomitant or secondary infection by the *Bacillus influenzæ* or any other bacteria could cause the production of their respective antibodies, but this we would not regard as essential unless the bacteria in question were definitely responsible for secondary infections during the course of the disease.

The general opinion is probably that those bacteria (*Bacillus influenzæ* in particular) known to be present in the lungs and bronchial secretions have exercised a very important effect upon the course of the disease. Our results with the agglutination tests have made us very sceptical of this (except late in the course of a retrogressive case), and leads us to believe that the all important factor is the development of the resistance of the host to the real

ætiological agent, and that when this has not been accomplished, the other secondary organisms are able to exert their pathogenic effect.

A certain amount of work has been reported in which the endeavour has been to reproduce the disease in human volunteers or animals by inoculation with:

(*a*) the body fluids of the patient;
(*b*) filtrates of the body fluids;
(*c*) culture of the filtrates of body fluids;
(*d*) and when success was assumed in the above by continued animal passage experiments.

Nicolle and Lebailly[3] have reported upon the virulence of unfiltered sputum to monkeys when inoculated by the subcutaneous and nasal route; they have also observed that the subcutaneous inoculation of filtered sputum produced a certain malaise. These symptoms are not necessarily indicative of an attack of the disease.

Rosenau, as reported by Keegan[4], failed to infect nine volunteers by injecting the filtrate of the bronchial secretion plus the filtrates of the washings of the nasopharyngeal mucosa of two typical cases of influenza.

Gibson, Bowman and O'Connor[5] report instances of positive infection in monkeys and other laboratory animals by injection of filtered and unfiltered sputum, and also by blood, filtered and unfiltered. Further, they observed a small coccoid body in the filtrate which is viable and can be subcultured in suitable media (Noguchi's), and which has the same or approximately the same pathogenicity as the original body fluids.

Their work has not yet been published in detail, and consequently we are unable to consider the exact data upon which they conclude that pathogenic effects were demonstrated in monkeys. With these animals it must be remembered that the temperature range normally is very wide and, as well, rises in temperature to 103° F. must, we think, be viewed with the greatest reserve unless, of course, this is consistently obtained in more than a few animals, and as well some distinctive pathological lesion.

Bradford, Bashfort and Wilson[6] in a short preliminary article report upon the pathogenicity of cultures of minute coccoid bodies very similar to those described by Gibson and his co-workers. These filtrate cultures were recovered, not only in influenza, but in trench fever and in many other conditions.

Our own attempts to produce the disease in animals were hampered by the difficulty of procuring monkeys in sufficient

numbers to enable us to make all necessary experiments. However, six monkeys were obtained, and these, together with guinea-pigs, mice and pigeons, were injected with both whole and filtered blood without any evidence of positive takes being adduced. It was, however, possible to demonstrate that pure cultures of *Bacillus influenzæ* were capable of causing death when injected into guinea-pigs.

Our experiments failed to show susceptibility of monkeys to the virus of epidemic influenza. As shown in the appendix, the injection in comparatively large quantities was not followed by definite infection even though simultaneous injections were given of *Bacil us Welchii* toxin. The *Bacillus influenzæ* was also avirulent to monkeys as the inoculation (intra-pulmonary) of a heavy emulsion failed to produce more than a malaise of short duration.

TABLE IA

Showing the dilution of serum in the serial tubes as carried out in the agglutination reactions.

Dilution of serum	1/30	in tube 1
"	1/60	" 2
"	1/120	" 3
"	1/240	" 4
"	1/480	" 5
"	1/960	" 6
"	1/1920	" 7
"	1/3840	" 8
"	1/7680	" 9

TABLE I.

Gives the agglutination results which were obtained from sera of recovered cases on October 30th, 1918, in the following twenty-one sera.

Serum from Case No.	No. of serial tube in which the highest dilution of patient's serum agglutinated pooled emulsion of *Bacillus influenzæ*.
17, 16	9
15, 2	7
14, 6, 3, 1	5
12, 11, 10, 9, 7, 5, 4	4
20	3
18	2
21,19, 13, 8	0

Several of these sera were tested against different strains and various pooled emulsions as shown in Table II. Numbers below one hundred represent pooled emulsions.

TABLE II.

EMULSIONS OF *Bacillus Influenzæ*

Serum No.	No. 7 pooled	111 strain	114 strain	112 strain	No. 8 pooled	No. 7 pooled	101 strain	106 strain	103 strain
15	7	?	5	9	9	7	9	..	9
16	9	9	9	9	4	9	9	9	9
17	9	9	9	9	9	9	2	9	9
18	2	?	?	9	Neg.	2	2	Neg.	Neg.
19	Neg.	1	Neg.	1	Neg.	Neg.	4	Neg.	Neg.
20	3	2	1	9	Neg.	3	3	3	Neg.
21	Neg.	3	2	1	Neg.	Neg.	9	9	Neg.

Serum No.	102 strain	117 strain	Douglas	104 strain	107 strain	115 strain	116 strain	113 strain	110 strain
15	9	9	9	9	Neg.	9	9	7	9
16	9	9	9	9	5	9	8	9	8
17	9	9	9	9	3	9	9	9	9
18	2	2	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	2
19	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	2
20	Neg.	Neg.	1	Neg.	3	Neg.	2	Neg.	Neg.
21	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.

The positive tubes in the above experiments had shown up very clearly either as heavy flocculi sinking to the bottom of the tube or as a granular precipitate, or both.

Controls of saline with the bacillary emulsions were made with each series of serum dilutions; additional controls of normal horse and normal rabbit serum failed to show any agglutination.

Thus far the agglutination tests were read after overnight incubation at 37·5° C. With the view of determining the temperature which would best facilitate the reaction, dilutions were made in duplicate sets and heated at 37·5° and 50° C. But while this work was being carried on, it was noticed that even sera, hitherto strongly positive, began to show indefinite agglutination and finally no agglutination which is illustrated in Table III. The lower temperature more frequently gave chance results than the higher, but required a longer exposure. The agglutinous so rapidly disappeared from the serum from this time on that it was felt no satisfactory conclusion could be drawn regarding this point. Culturally and morphologically, no change could be detected in the strains, and fresh serum drawn from case No. 15 on November 22nd, 1918, failed to show any agglutination.

TABLE III.

EMULSIONS OF *Bacillus Influenzæ*

Serum from Case No.	Strain 101	Strain 112	Strain 102
15	0	0	0
16	0	0	1
14	0	4	0
19	0	1	0

Guinea-pigs were found to be easily infected and killed by inoculation with different strains of the *Bacillus influenzæ*. At first a simultaneous injection of *Bacillus Welchii* toxin was given, but this was afterwards found to be unnecessary. It was found, however, that an old culture (ten days) of *Bacillus influenzæ*, which had failed to subculture, was pathogenic for guinea-pigs, could be recovered and cultures, if *Bacillus Welchii* toxin was injected simultaneously. Animal passage, however, did not seem to materially increase the virulence; these results are illustrated in Table IV.

TABLE IV.

G.P.	Weight grams	Strain	Amount c.c.	Path.	Bacillus Welchii Toxin	Result
484	320	101	0·5	intra-periton	·03 cc. per 100 grams	Died, recovery of *Bacillus influenzæ*
485	320	101	0·5	"	"	"
486	315	101	0·5	"	"	"
487	320	101	0·5	"	"	"
490	325	112	0·5	"	"	Lived
488	330	112	0·5	"	"	Died
480	300	101	0·4	intra-pulmonary	....	Died, recovery of *Bacillus influenzæ* in lungs and heart
64	315	101 (passage strain through 480)			"	"

The results of the inoculation of monkeys with both filtered and unfiltered blood drawn from acute febrile cases is given in Table V. The clinical feature of the cases and the technique adopted in the preparation of the inoculation might be summed up as follows:

Case A presented an acute febrile condition, and ran a typical course without pneumonia. Within forty-eight hours of the onset of first symptoms 20 c.c. of blood were withdrawn aseptically into an equivalent amount of 1·25 per cent. sterile sodium citrate solu-

tion and incubated at 37·5° C. Aerobic and anerobic cultures made from this incubated blood mixture failed to show any evidence of bacterial growth.

Case B presented clinically similar features to Case A, and blood was withdrawn under similar conditions. Culturally, the results were negative. Twenty c.c. of the citrated blood were centrifuged and the supernatant fluid (14·5 c.c.) pipeted off, diluted with saline solution and filtered through a Berkfeldt candle. The deposit of cells was lysed with distilled water and together with the diluted serum filtered, the total amount of saline and distilled water required to effect filtration being 35·0 c.c. This method of diluting and lysing the blood facilitates filtration by giving an even fluid mixture in which there are but a few granules of cell stroma.

Case C presented the same clinical aspect and ran a similar course to Cases A and B. Twenty c.c. of citrated blood were diluted and lysed with 40 c.c. of saline and distilled water in order to effect filtration as described with Case B All aerobic and anerobic cultures were negative. Previously cultures had been attempted by using both human blood and horse serum enriched fluid and solid media; in this batch, heated blood media as then advocated for the culture of the *Bacillus influenzæ* was tried in addition.

As we were able to procure only a few monkeys at irregular intervals, it was impossible to plan any comprehensive protocol. Our chief endeavour was to demonstrate whether or not definite pathogenic effects could be produced in monkeys by the injection of the blood collected from suitable cases.

Attempts to take four hourly temperature observations failed, as it was found impossible to handle the animals. Previously we have had considerable experience with monkeys and rarely had any difficulty in handling them, yet with these the greatest trouble was experienced, so that often an hour or more was necessary before the animal could be injected. This was not perhaps as important as it might appear at first sight, because, while the development of fever would undoubtedly be of the utmost significance, it is difficult to be certain just what degree of temperature really represents fever in the monkey. The range in normal monkeys in this climate at any rate is very wide and varies between 99° and 103° F. or even slightly higher. Further following the injection of bacteria free protein solutions such as blood or serum, irregular records between 103° and 104° F. may be observed.

When these experiments were in progress work was also being carried on with *Bacillus Welchii* toxin (filtrate) of definite potency

TABLE V.

Monkey	Weight	Inoculate	Amount	Site	Result
1. M. Rhesus.....	20 lbs.	Case A. Unfiltered citrated blood (incubated 18 hours.)	7·0 c.c.	Peritoneal and subcutan.	Some malaise, complete recovery two days.
2. M. Rhesus.....	35 lbs.	Case B. Filtered blood and B. Welchii toxin (incubated 18 hours)	30 c.c. 2·5 c.c.	Peritoneal and subcutan. Muscles of back	Died on fourth day. Post-mortem pleural and peritoneal cavities normal. Lungs emphysematous. Abscess at site of inoculation in back muscles.
3. M. Rhesus.....	20 lbs.	Case C. Fresh filtered blood and B. Welchii toxin	35·0 c.c. 2·5 c.c.	Peritoneal and subcutan. Muscles of back	Very ill. Complete recovery four days.
4. Bonnet.....	18 lbs.	Case C. Fresh unfiltered citrated blood and B. Welchii toxin	15·0 c.c. 1 c.c.	Peritoneal and subcutan. Muscles of back	Very ill. Complete recovery four days.
5. M. Rhesus.....	20 lbs.	B. Welchii toxin	3·0 c.c.	Muscles of back	Very ill. Complete recovery four days.
6. M. Rhesus.....	35 lbs.	Thick saline emulsion B. influenzæ, Strain 101 and B. Welchii toxin	1·2 c.c.	Intra-pulmonary Muscles of back	Very ill, recovery three days.

to guinea-pigs (0·6 c.c. M.L.D. per 100 gms.) so that it seemed advisable to administer this together with the blood mixtures. Bull[7] had found that this toxin lowered the resistance of the host so that an increased pathogenicity of a simultaneously injected organism could then be demonstrated. This had also been our experience. Monkey 2, the only one to succumb during the experiments, should not have been used, as he was an aged asthmatic, plainly distressed when delivered and in the opinion of the zoological attendant, liable to die at any time. He was amongst the first three monkeys obtained and only used because it seemed likely that no others might be obtained. In the second lot of monkeys, No. 5 was used as a control for the *Bacillus Welchii* toxin as we had committeed ourselves to this method of attempting to reduce the host's resistance. The malaise following this injection of toxin seemed to be identical in character, with that which followed the double inoculation in the other animals, so that no characteristic effect could be definitely attributed to the injection of blood from patients suffering with influenza.

A Review of the Literature Subsequent to the Writing of This Paper Brings to View the Following Observations of Importance

Huntoon and Hennum[8] report the production of a toxic substance (endo-toxin in character) by *Bacillus influenzæ* against which an immune serum gives protection; by agglutination tests differences in the titre are demonstrated amongst the different strains but between all strains, collected from widely separated geographical areas, close relationship was shown either directly or indirectly through cell absorptions. They conclude there is nothing in the serological evidence to preclude the consideration of this organism as an important factor in the causation of clinical influenza.

Park, Williams and Cooper[9] by cross agglutination tests showed multiplicity of strains and they conclude that the influenzæ bacilli like the streptococci and pneumococci are in all probability merely very important invaders.

Ferry and Houghton[10] demonstrated the pathogenicity of the *Bacillus influenzæ* to monkeys, rabbits, guinea-pigs and white mice, although they point out that the production of influenzal meningitis in the monkey depended upon the selection of a virulent culture. They corroborated the work of the authors already mentioned and

Parker with reference to the production for all strains of soluble toxins fatal to rabbits in intravenous doses of 2 to 5 c.c. In agreement with others they show that antitoxin is protective both against the toxin and infection by the bacilli, and point out the parallelism following injections of *Bacillus influenzæ* or soluble toxins to the condition found during the early stages of influenza in the human.

Gray and Harris[11] note that there is evidence of the rapid loss of agglutinins in unheated serums. This was of particular interest to us inasmuch as it was so marked that it automatically interrupted further work contemplated and led us to view with doubt at the time certain results on other types of cases.

REFERENCES:

1. COHEN and FITZGERALD.—*Central F. Bakt*, 1910.
2. SPOONER, SCOTT and HEATH.—*J. A. M. A.*, January 18th, 1919.
3. NICOLLET and LEBAILY.—*B. M. J.*, December 14th, 1918.
4. KEEGAN.—*J. A. M. A.*, September 28th, 1918.
5. GIBSON, BOWMAN and O'CONNOR.—*B. M. S.*, March 22nd, 1919.
6. BRADFORD, BACHFORT and WILSON.—*B. M. S.*, February, 1919.
7. BULL.—Personal communication.
8. HUNTOON and HENNUM.—*J. of Immunology*, vol. iv., July, 1919.
9. PARK, WILLIAM and COOPER.—*Proc. of the Soc. for Exp. Biol. & Med.*, vol. xxi, No. 7, April 16th, 1919.
10. FERRY and HOUGHTON.—*J. of Immunology*, vol. iv., July, 1919.
11. GRAY and HARRIS.—*J. Inf. Diseases*, November, 1919.

THE Lieutenant-Governor of Saskatchewan, Lady Drummond and Colonel Noel Marshall were appointed delegates to the League of the Red Cross societies of the world arranged to be held in Geneva, Switzerland, in the month of March. Canada, as a national member of the League, is entitled to representatives to the number of five at this world wide meeting.

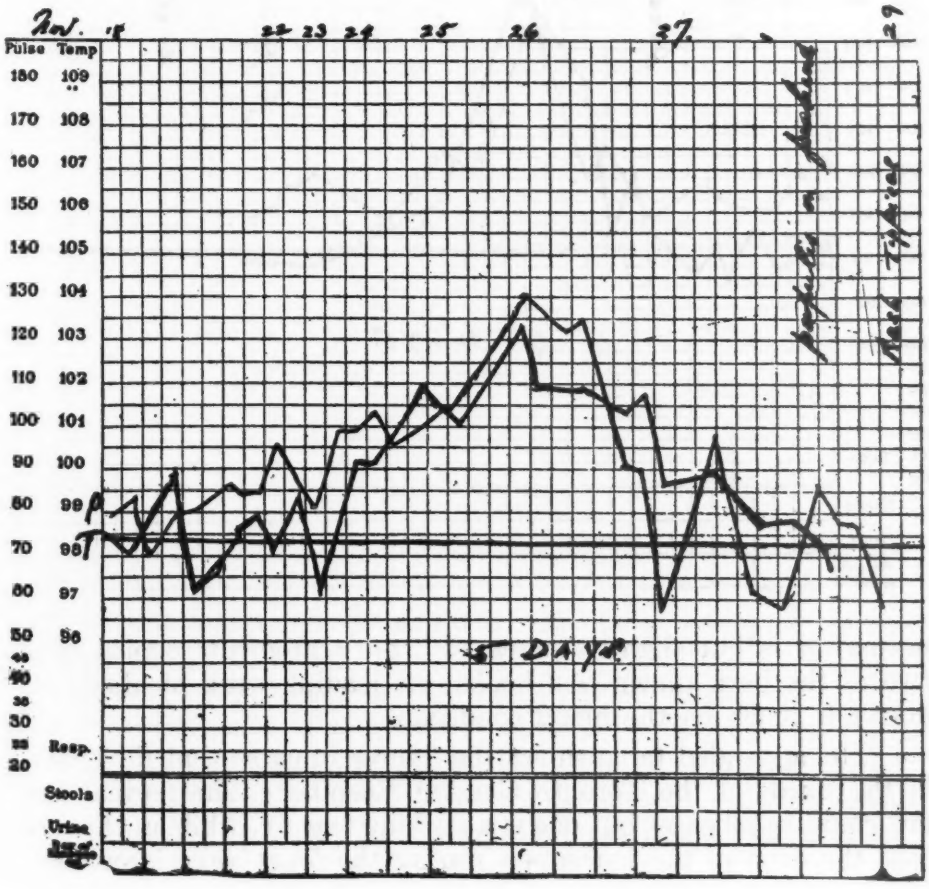
ON THE EARLY DIAGNOSIS OF VARIOLA

A NOTE ON THE CONDITIONS OF THE BLOOD AND SPLEEN

By N. B. Gwyn, M.B.

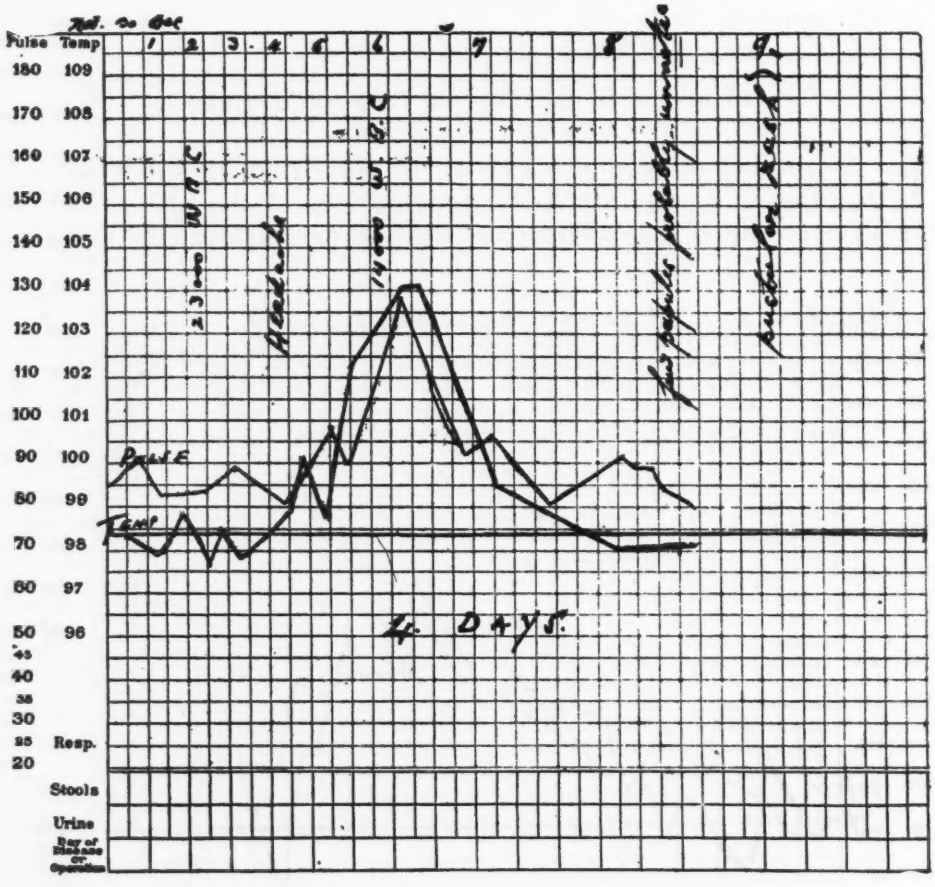
Clinician to the Toronto General Hospital

IN the present epidemic of variola, we have had some few opportunities to make very early examinations of the blood, and in at least two instances were struck by the firm enlargement of the



spleen. Our own difficulties in diagnosis have induced me to review briefly our knowledge of this early stage of the disease and to collect our records in the few cases which have developed from time to time under our eyes in the wards of the hospital.

The blood picture of small-pox is by no means clearly drawn. "In variola vera there is a marked leucocytosis about the eighth day," "During the febrile period, the number of leucocytes remains



normal or is but slightly increased " are statements copied from two of the best known text-books. A leading work on diagnosis does not touch on the blood condition.

The appended table shows the figures in cases that developed in the wards of the Toronto General Hospital. The normal and low count in all cases but one is a striking feature, while in this one case the drop of the leucocytes during the fever wave is evident;

of particular interest is the last case, one of pernicious anæmia, in whom an abnormally low white blood count (2,200) was not increased during the whole of his pre-eruptive stage of variola. In the table the relation of the count to the termination of the primary fever wave is indicated. It can be clearly seen that no rise of the leucocytes takes place during the period of primary fever. "The leucocyte count is normal or is even lowered" is the

Case	Courtesy of	Sex	Age	Probable Onset	W. B. C.	Temp. dropped
1.	Clinicians in "G".	F.	20	30–10–19	3–11–19 4–11–19 5000 4600	14–11–19
2.	Clinicians in "G".	F.	67	17–11–19	20–11–19 5600	21–11–19
1.	Clinicians in "G". 25–10 Admitted Bronchitis 8000 B.W.C.	F.	67	2–12–19	2–12–19 6–12–19 23000 14000	7–12–19
4.	Clinicians in "G". 1–11–19 Admitted Diabetes	F.	52	16–11–19	16–11–19 17–11–19 7000 7000	17–11–19
5.	Burnside Chief	F.	16	16–11–19	20–11–19 7500	20–11–19
6.	Clinicians in "G".	F.	23	26–11–19	29–11–19 9000	29–11–19
7.	Dr. Howland	M.	50	24–11–19 22–10	25–11–19 26–11–19 8800 8200 6800 Spleen + +	28–11–19
8.		F.	34	6–12–19	14–12–19 6500 Spleen + +	13–12–19
9.	Clinicians in "H".	M.	57	1–12–19	7–12–19 2200	5–12–19

more correct statement in regard to the blood condition of our few patients.

"Spleen enlargement in the late pustular stages" is spoken of by Councilman. "The spleen is markedly enlarged," according to Osler's "Morbid Anatomy of Variola." This most probably refers also to the spleen late in the course of the disease. Early splenic swelling is considered as "not a constant feature of the disease" by the first named observer.

Two of our cases in the series in which the condition of the spleen was early and carefully investigated, gave these details: "The spleen is enlarged, firm, and presents a rounded edge." So marked was this enlargement in one case that the fingers of the palpating hand could feel the border without the respiration usually asked for. The firmness of the organ in a second case was like that felt in the malarial infections. In this case, the fever, absence of backache and low leucocyte count had suggested typhoid fever, but the solid impression given by the spleen was noted as unusual for early typhoid. Two complete primary fever waves are given; one has not often the chance to observe such waves in their completeness. Four days seems to be the definite duration of the fever of the early stage. The day of appearance of eruption is noted. It is probable that in both instances the very earliest papules passed unnoted.

It is suggested by these few notes that a normal or even low leucocyte count and an unusually firm large spleen may be found in the pre-eruptive stage of mild variola. Such a detail may be of use in early diagnosis, and we hope may be confirmed by a more extensive investigation by those practitioners and others who have occasion to see early the suspect cases now occurring in the province.

TRADITIONS that the birth-rate of a country always increases after a war has been proved fallacious in Paris; statistics of the prefecture of police, show the rate is still sinking. It is true that the number of births in recent months has been higher than ever, but this is said to be due to the fact that the population of Paris has been augmented by 500,000 persons during the last year. The percentage of births per thousand of population is declared to be the vital test, and it is declared to be lower, at present, than it was before the outbreak of the war in 1914.

From 1883 until 1913 the percentage of births declined until it reached 17 per thousand. At that time the population of the city was 2,900,000. During the war the number of births decreased; there were 30,000 in 1915 and 28,000 in 1916, which exactly equalled the number a century before when the city's population was 700,000.

Obiter Scripta

FROM CASE REPORTS IN THE MEDICAL CLINIC, ROYAL VICTORIA HOSPITAL, MONTREAL.

1. Case of Dr. C. F. Martin, Attending Physician, and D. M. Caldwell

Pulmonary Abscess following Extraction of the Teeth. Cure by Artificial Pneumothorax.

The patient, F. P., a woman twenty-seven years of age, entered the hospital January, 1920, complaining of cough, dyspnœa, pain in the chest and fever. Two weeks prior to this some teeth had been removed under an anæsthetic (ether), and when a few days later she developed pain in her chest with cough and expectoration, it was thought she had contracted a cold from exposure to the inclement weather. When, however, on the following day, the sputum was copious, brownish in colour, purulent and foul-smelling, the suspicion was aroused of some intrapulmonary lesion. Definite chills recurred from time to time, with fever and night-sweats. A few days later she was removed to the hospital. Here the examination revealed the usual signs of a localized lesion in the uppermost lobe of the right lung. The sputum contained a varying bacteriological flora but no tubercle bacilli. Elastic tissue was present. A skiagram revealed the presence of a well localized cavity in the lung half-filled with fluid. For a week there was irregular temperature, after which the condition was afebrile.

Because of the well circumscribed character of the lesion the patient was referred to the surgical service for either drainage or treatment by artificial pneumothorax. Dr. E. W. Archibald elected the latter method, and after a few such treatments the patient left the hospital in excellent condition.

Note: Abscess of the lung following the extraction of teeth has not been uncommon in our service. In some cases, portions of a tooth are inhaled and the foreign body has set up an abscess which remained for many months, and in one case spontaneous healing followed upon the expectoration of the tooth after a period of nine months. In others, less fortunate, the abscess has developed

so widely as to make operation unsatisfactory. This is the first instance in which an artificial pneumothorax has been successfully used in our service for an abscess of this nature.

2. Case of Dr. C. F. Moffatt, Associate in Medicine.

Severe Purpura Hæmorrhagica (Morbus Maculosus Werlhofii). Cured by Direct Transfusion.

I. W., age twenty-three, female, was admitted to the hospital January 27th, 1920, for persistent purpura.

She had always been healthy up to the age of sixteen years, when the thyroid gland became moderately enlarged and has persisted so in varying degree up to the present time.

The first sign of her present illness was manifested eighteen months ago when slight trauma produced bluish marks on the skin. Later on she had occasional severe nose-bleeds.

In February, 1919, after an attack of influenza, petechial spots appeared on the extremities, and another severe epistaxis occurred.

During convalescence the menstrual period persisted for two weeks with an excessive flow retarding her progress. One month later there was such excessive flow and resulting anæmia, that she was admitted to a hospital and a blood transfusion performed May, 1919.

Convalescence was rapid and she was up and about until her next menstrual period which was again excessive. Her condition becoming alarming from the continued loss of blood, a second transfusion was given, but with less beneficial results than on the previous occasion. A partial hysterectomy was performed as a last resort in June, 1919.

The recovery from the operation was slow, and the purpuric spots were so persistent and diffuse that she was finally sent to the Royal Victoria Hospital. Here she made considerable progress, regain ng her weight and colour for a time, but she did not regain her former vigour, having marked palpitation and dyspnœa on exertion. When long on her feet, the purpura which had never disappeared, increased greatly. There appeared subconjunctival hæmorrhages, hæmorrhages into the mucous membranes of the mouth and into the tongue, innumerable spots on the extremities and trunk, but none on the back. An occasional epistaxis accompanied a fresh crop of purpura. Finally, on January 25th, 1920, there was an attack of nausea and vomiting

and shortly followed by an abundant *hæmaturia*. The pulse was notably slowed, 46–60 per minute, and at no time was there any rise in temperature.

The *blood picture* at this time was as follows:
Clotting greatly retarded, Hgb. 65%, Reds 3,700,000; Whites 7,500.

Differential Count:

	Polymorphonuclears.....50·3 per cent.
	Lymphocytes, small....33·1 per cent.
Poikilocytosis	Large mononuclears.... 7·3 per cent.
	Transitionals..... 2·4 per cent.
	Mast cells..... ·9 per cent.

No nucleated reds or pathological cells were seen.
Blood pressure 110–85.

The amount of urine varied from twenty-five to thirty-five ounces in the twenty-four hours. It was markedly hæmorrhagic, with a few clots at the bottom of the vessel. There was a small amount of albumin.

Treatment: On January 28th, 80 c.c. normal horse-serum were given subcutaneously in divided doses, but beyond producing troublesome local capillary hæmorrhages and urticaria, no other results were noted.

As the condition became decidedly worse with increase of the anæmia and circulatory weakness, pulse, 150, respiration, 30, temperature, 99·5°. A blood transfusion—840 c.c. by the Unger direct method was performed by Dr. Levine, (and without any marked reaction), on February 8th.

The transfusion had an immediate and striking effect upon the patient's general condition, and on the hæmaturia in particular. Within twelve hours the urine was clear and in forty-eight hours only three or four red cells per field could be seen microscopically and at the end of five days the urine was normal, and has remained so.

With the disappearance of the hæmaturia, the purpura and subjective symptoms have completely disappeared, and she has rapidly gained in strength and colour up to the present—five weeks after transfusion.

Note. This case illustrates the value of transfusion over other methods of treatment for this disease, more particularly over the value of horse serum which had been repeatedly tried in large doses without effect.

3. Case of Dr. E. H. Mason, Director of Metabolism Clinic.

Chronic Parenchymatous Nephritis (Nephrosis), Illustrating the Results Obtained by Dietetic Treatment.

H. D., male, aged thirty-two, was admitted to the Metabolism service with swelling of the face and feet. The patient contracted nephritis in 1916 while on active service in France.

At this time he had headaches, œdema and hæmaturia, and these symptoms have recurred at intervals ever since.

On entering the hospital, the urine was clear, amber in colour, sp. gr. 1018–1024; albumen 3 grms. per litre, and there were hyaline, granular and leucocytic casts present, as well as renal cells, leucocytes, and a few red blood cells.

Kidney function. Phthalein 74 per cent. in two hours. Mosenthal's nephritic test meal, showed the day urine 714 c.c. the night urine 735 c.c. The sp. gr. varied from 1014–1025. The ability to concentrate nitrogen at night 0·81 per cent. The blood urea normal, 0·36 grms. per litre. The rate of excretion of urea 50 per cent. of normal. The blood plasma chlorides 6·30 grms. per litre with threshhold of 6·03 grms. per litre.

These findings, with the history, indicated a degenerative nephritis of the parenchymatous type. There was obvious impairment of capacity to excrete nitrogen end-products and sodium chloride.

Treatment. The treatment was entirely dietetic, 1 gram of protein per kilo body weight and enough fat and CHO to give 33 calories per kilo. The amount of fluids allowed was 1,500 c.c., and no free salt was given.

After two weeks 1½ grms. of protein were given with enough fats and CHO to give 35 calories per kilo.

The kidney function was studied at weekly intervals thereafter, and showed steady improvement.

Upon discharge some weeks later, the test meal showed day urine 660 c.c., the night urine 303 c.c. The sp. gr., varied from 1010–1025. The nitrogen concentrated at night to 0·95 per cent. The blood urea was 0·30 grms. per litre, with rate of excretion of urea 105 per cent. The blood plasma chlorides were 6·05 grms. per litre with a threshhold of 5·87 grms. per litre.

Upon discharge, then, the patient had practically a normal kidney function for water, salt and nitrogen. The urine still contained 1 grm. of albumin per litre, with a few hyaline and granular casts.

The general condition was much improved, and barring any complicating infection, a careful dietetic control would keep the patient in good health for a long time to come.

4. Notes From Radiographic Department, by Dr. Pirie, Director.

A New Method of Confirming the Diagnosis of Cirrhosis of the Liver by Radiography.

The injection of the peritoneal cavity with oxygen, as brought to our notice by Dr. Stewart of New York, seems at first sight to be a rather heroic procedure in order to arrive at a diagnosis; but a few cases have demonstrated its s mplicity and safety as well as its very slight inconvenience to the patient.

The value of the method lies in the information which can be obtained by means of *x*-rays when an abdomen is inflated with oxygen.

The liver, the spleen, the kidneys, tumour masses, the ovaries, and the uterus can be rendered visible by this method.

We have been able to demonstrate very distinctly in several cases bands of adhesions between the abdominal organs and the abdominal wall. The method also proved of use in a case where subphrenic abscess was suspected. In this instance a clear space was demonstrated between the upper surface of the liver and the under surface of the diaphragm, thus excluding the possibility of such a condition.

The third case, in Dr. W. F. Hamilton's service, confirmed in a convincing manner the value of the method. It was one in which the patient suffered from extensive ascites and a definite diagnosis had not been arrived at, although *cirrhosis* of the liver was suspected. Some of the abdomina fluid was withdrawn and about a *litre of oxygen was injected.* The patient was placed in the upright position so that the oxygen lay under the diaphragm making the outline of the liver and spleen clearly visible.

The outline of the spleen was clean cut and distinct while the surface of the liver presented an *irre ular, nodular* appearance such as one would expect in cirrhosis hepatis. Carcinoma had already been excluded—from the history and duration of the illness.

The *x*-ray in this case clinched a diagnosis of cirrhosis of the liver, which up to then had been doubtfu .

These three pathological conditions are the only ones in which

we have obtained positive information by inflation of the peritoneal cavity with oxygen.

The method is still in its infancy and has not as yet been adopted as a routine.

5. Case of Dr. Norman Brown, Director of Physio-therapy.

Myocarditis with Sudden Death, Illustrating the Significance of the Inverted T in the Electrocardiogram as a Grave prognostic sign.

J. T., aged fifty-five, an engineer in the Imperial Service, and formerly an athlete, had been in good health till August, 1919. He was then seized with a sudden attack of faintness, palpitation, and a sense of suffocation. There was no pain. He recovered spontaneously in a few hours Following upon this attack he suffered some slight sense of oppression from time to time, and came to the hospital for advice.

Examination at the time revealed, briefly, the following condition: A well-built man, with pulse 60 and regular. The heart was slightly enlarged to the left, but there were no murmurs. The lungs were normal, except for a very slight basal bronchitis. The blood pressure was 160-110. The urine contained a faint trace of albumin, but no other abnormalities Skiagram of the chest showed some enlargement to the left. The electro-cardiagram showed left preponderance, and *an inverted T in all three leads.* Beyond slight dyspnœa on exertion there was no evidence of decompensation. He returned to his home in England where for some months he enjoyed apparently complete health, though living moderately according to advice. Death came suddenly from an attack similar to those already described.

Note: This is one of a series of six cases bearing out the grave prognostic significance of the inverted T in all three leads.

Case Reports

SYNOPSES OF CASE REPORTS FROM THE MONTREAL GENERAL HOSPITAL

Late Results in a Case of Resection of Small Intestine for a Fibro-Sarcoma Associated with a Recurrent Melæna

MONTREAL General Hospital Surgery, 1, 1912. A. F., age forty-three years, female, unmarried, was admitted to the hospital on January 1st, 1912, complaining of hæmorrhage from the bowel.

Past History. About twenty-four years ago she had two small cyst-like tumours removed from the upper border of the left breast. Nine years ago she had chlorosis associated with hæmorrhage from the bowel, gastric pain one and a half to two hours after meals and occasional vomiting, for which she was treated in a hospital. A diagnosis of possible duodenal ulcer was made. Two years ago she was again in hospital on account of abdominal pain. She states the diagnosis at this time was gastric neurosis. Medical treatment was carried out for two or three weeks when she was discharged improved. Since then she has had more or less gastric distress, and has occasionally vomited a bright yellow watery fluid, but never any blood or any material resembling coffee grounds. Melæna has been present at times but never marked. She has been constipated. Her appetite has been fair. Nothing important in her menstrual history.

Present Illness. This began three days before admission to hospital, when she had severe melæna followed by pain in the abdomen. She vomited once—a bile stained fluid.

Present Condition. Undersized and poorly nourished woman. Skin and mucous membranes blanched. Pulse 120 volume and tension low. Temperature 99·4°, respirations 20. Tongue clean, teeth good. The abdomen is symmetrical and moves fairly well on deep respiration. The abdominal muscles are resistent and deep palpation is unsatisfactory. An area two inches in diameter situated one inch to the left of the umbilicus is definitely tender.

Slight tenderness is present in the epigastrium. No tenderness in the right or left lower quadrant and no dulness in the flanks. Lungs are normal.

Blood Count. Red blood corpuscles, 4,000,000; white blood corpuscles, 9,000; hæmoglobin, 35 per cent. (Salhi)

There was an encouraging improvement in her condition during the first three days after admission. The pulse dropped to 84, and the stools which at first contained a large amount of blood became slate coloured.

On the morning of the fourth day in hospital she had a sudden severe pain in the abdomen with nausea, marked rigidity and tenderness all over the abdomen, pallor, great weakness and a pulse rate of 132. Immediate operation was undertaken for what was thought to be an actively bleeding duodenal ulcer with perforation. Under gas-oxygen anæsthesia the abdomen was opened in the midline above the umbilicus. There was no soiling of the peritoneal cavity, nor any free blood present, and an examination of the stomach and the duodenum failed to reveal any evidence of lesions in these organs. Exploration of the ileo-cæcal region revealed a mass which on delivery was found to consist of deeply congested ileum, situated on the free border of which was a firm tumour. This mass was about three feet from the ileocæcal valve. The tumour itself was attached to the large intestine by stout bands of fibrous adhesions two inches long. The loop of ileum containing the tumour was twisted on its mesentery forming a volvulus situated beneath the fibrous bands which held the mass securely to the large intestine. These bands were divided, ends cauterized and the mass and loop of intestine freed. Blood clot was present in the large and small bowel, but in the latter only distal to the mass. Resection of the bowel at a distance of three inches on either side of the tumour, was done, and an end to end anastomosis established. The patient was given 350 c.c. of saline intravenously before leaving the operating room. She responded well to post-operative treatment which consisted of pituitary extract minums 10 and strychnine grains 1-30 hypodermically every four hours and rectal saline of 6 ounces with one half ounce of brandy. The stools were free from macroscopic blood twenty-four hours after operation, but continued to give the phenolphthalein reaction up to the tenth day. She was discharged from the hospital in good condition three weeks after operation.

Examination of this patient eight years after operation showed her to be in good general condition. The abdominal incision was

firm; she was on an unrestricted diet which she took with relish; weighs 110 lbs.—her best before operation had been 98 lbs.—bowels are regular and at no time since leaving the hospital has she ever noticed any signs of blood in her stools.

Pathological Report. The tissue is ileum with attached tumour, both of which are deeply congested. The tumour which is egg shaped and measures 5 x 4 cm. in its greatest diameter is situated between the mucous membrane of the intestine and the peritoneum, replacing the intervening tissues. The tumour projects into the intestinal lumen for a distance of 1·6 cm. It is moderately firm, pale red, and its vessels stand out very prominently. There is no gross evidence that it is actually infiltrating the tissues about it. The mucous membrane of the intestine, especially where it is reflected over the tumour, is very deeply congested, and its blood vessels stand out prominently. No bleeding points are seen. Histologically, the tumour conforms to that of a slowly growing fibrosarcoma. The vessels throughout the tumour and those within the intestine are widely dilated

Remarks. The hæmorrhage in this case most probably came from the mucous membrane of the intestine involved in the volvulus and especially from that covering the tumour. Had it been secondary to a gastric ulcer the vomitus would have contained blood and had it come from either a gastric ulcer or a duodenal ulcer, some evidence of such lesion would most probably have been found at the operation. Besides this, blood was not present in the lumen of the intestine above the volvulus, and there has been no recurrence of melæna since operation.

W. L. Barlow,

Asst. Surgeon to the Montreal General Hospital.

TORSION OF AN OVARIAN CYST COMPLICATING PREGNANCY

MONTREAL General Hospital, No. 1019, 1920. Mrs. K., aged twenty-eight years. Previous medical history unimportant. Menstruation regular every thirty-one days until November 23rd, 1919. The patient was examined early in February, 1920, when an eight to ten weeks' pregnancy with no abnormality was found.

She was advised to take special care of herself at such times as menstruation would have occurred, had she not been pregnant.

On the night of February 28th, while walking, she was seized with sudden crampy pains in the lower abdomen, so severe that she had to lie down. The pain recurred at irregular intervals. When the patient telephoned for advice she said that it was just the time of a missed period, and acting on the assumption that there might be compression of the ovary, she was advised how to take Sims' position, with the result that a few minutes later it was reported that the pain was very much more severe.

The patient was seen at 1 a.m., February 29th. The temperature was normal; the pulse 84. There was indefinite and unlocalized tenderness in the right lower quadrant of the abdomen. Palpation of the uterus per vagina was negative; there was a slight resistance between the right cornu of the uterus and the pelvic wall. Questioned as to the possibility of previous attacks of appendicitis, the patient stated that she had had slight pain of a similar character previously, but that though repeatedly examined, no evidence of appendicitis had been made out.

Administration of morphine by mouth was followed by slight relief of the pain. She vomited once, possibly due to the morphia.

When the patient was seen again at 10 a.m., the spasmodic attacks of pain were recurring every fifteen or twenty minutes, but there was no evidence of local or generalizing peritonitis. The temperature was normal and the pulse 88. Suppositories of opium were given during the morning, but with very little effect. At 3 p.m. the pulse rate had risen considerably, but even at this time there were no definite localizing symptoms. At 10 p.m. the attacks of pain had become more frequent and more severe, and vaginal examination revealed an indefinitely pulsating mass in the right lateral fornix, but no change in the abdominal tenderness. The temperature was still normal, but the pulse was about 120. As the patient's condition was considered more critical, she was removed to the hospital.

Operation at 11.15 p.m. An incision was made in the right semi-lunar line and the appendix brought into the wound. It was about 12 cm. long and free from adhesions, but contained in the tip a large concretion. On inserting the fingers into the lower margin of the wound, there was delivered from the pelvis a cyst about 8 x 5 x 4 cm., together with the outer third of a very markedly œdmatous Fallopian tube. The ovarian vessels were ligated and the tumour, together with the distal portion of the tube was re-

moved. The appendix was amputated and the wound closed in the usual way.

The tumour in the right ovary was pale gray in colour and showed on the surface areas of mottling due to hæmorrhage. On section it showed diffuse hæmorrhage throughout the tissues. The appendix on section showed microscopically all the evidences of chronic appendicitis.

There were apprehensions lest abortion should ensue. The patient was given codeia grains one-half at intervals to relieve the pain resulting from slight distension of the bowel with gas, and on the third day following the administration of milk of magnesia with cracked ice and paraffin oil, ounce one-half, the bowel moved spontaneously, and under the same treatment continued to move without recourse to enemata. The patient sat up on the tenth day, and left the hospital on the fourteenth day, the pregnancy continuing its natural course.

Summary. Patient pregnant three months. Severe cramp-like pains very low in the abdomen occurring about the time of a missed period, and unrelieved by posture. Negative findings at first examination, but with subsequent congestion, due to obstruction to circulation, a tumour of the right ovary became definitely palpable. There was an associated chronic appendicitis. Rapid operation, with particular care in subsequent purgation, and satisfactory result so far as pregnancy was concerned.

H. M. Little,
Associate Gynæcologist to the Montreal General Hospital.

J. M. Elder,
Surgeon to the Montreal General Hospital.

CASE OF SPONTANEOUS HÆMORRHAGE FROM THE GREAT OMENTUM

MONTREAL General Hospital, No. 6648, 1918. Male, aged twenty-one years, single, Russian Jew, resident of Montreal, machinist, was brought to the hospital on a stretcher from a nearby residence at 10.30 a.m., November 25th, 1918, and admitted as a case of appendicitis with general peritonitis.

Complaints. Severe abdominal pain.

Family History. Irrelevant.

Personal History. In 1914 the patient had gonorrhœa, which he said was cured in six weeks. A second infection had developed two days before admission. He had never previously suffered from attacks of abdominal pain, nor had he ever been confined to bed through illness. He had not been working for three weeks prior to admission. He had not suffered from any injury nor had he been drinking.

Present Illness. On the evening of November 23rd, 1918, the patient went to bed at 10 o'clock, feeling well. At 2 a.m., November 24th, he was awakened with severe generalized abdominal pain, most marked in the right lower quadrant. Vomiting occurred at 10 a.m. Later in the day there was a free bowel movement. The pain was continuous and severe. At 4 p.m. the patient got up and visited a doctor, who told him that he had appendicitis, and administered morphine, with but temporary relief. During the night of the 24th the pain became much worse; it was still generalized, but predominant in the right lower quadrant. Nausea was present from time to time.

Condition on admission. The general appearance of the patient suggested hæmorrhage. The face was pale; the lips, by contrast, a fairly good colour. The abdominal facies was pronounced. He complained of severe generalized abdominal pain and tenderness, more intense over the appendix region. The mouth temperature was 98.3° the pulse 112, respirations 24. The thoracic organs were normal. The abdomen was full, fixed, resistant, and tender throughout, the resistance and tenderness being most marked over the appendix. There was dulness in the flanks. An acute urethritis was noted. The urine contained neither blood, albumin, nor sugar An enema, given shortly after admission, was effectual. The stool contained no macroscopical blood.

The first impression of hæmorrhage was overshadowed by the evidences of peritonitis, and a clinical diagnosis of general peritonitis, secondary to appendicitis, was made.

Operation one and a half hours after admission. Under open ether anæsthesia, an oblique incision was made over the area of maximum tenderness. When the peritoneum was reached, the nature of the abdominal effusion was realized. With the opening of the peritoneum there was a free flow of bloody fluid; an additional quantity was removed by suction. The head of the cæcum with the appendix was delivered. The appendix, which contained

a concretion, was removed, and on microscopical examination was found to be the seat of chronic diffuse inflammation. On exploration of the abdomen a large blood clot could be felt at the level of and to the right of the umbilicus. The original wound was therefore closed, and a second incision, six inches in length, was carried through the right rectus. When the peritoneum was divided, a clot the size of the hand, together with the great omentum, was extruded. The clot was found to be adherent to the lower margin and anterior surface of the right half of the omentum over an area about six centimetres square. This part of the omentum was reddened and œdematous. The omental vessels were moderately engorged, and numerous tongues of blood clot radiated between the omemtal layers. The point from which the hæmorrhage had occurred could not be definitely determined. The involved portion of the omentum was excised for microscopical examination, but unfortunately the specimen was lost in transmission to the pathological department. The abdomen was cleared of all blood-stained fluid, and a search was made for other possible sources of bleeding, but none were found. The wound was closed without drainage.

In the light of the operative findings, a further questioning of the patient elicited a history of severe nose-bleeds between the ages of thirteen and seventeen and one of slight amount about eight months before admission to hospital. He had never bled inordinately from minor wounds.

Final examination, March 20th, 1920, fifteen months after operation. The patient looked healthy. Urinalysis was negative. Blood pressure 112: 85. The patient stated that after discharge from hospital he did not feel fit to resume heavy work and got employment as a tailor. His general health had been good. In November, 1919, he had another slight nose-bleed.

In a careful search of the literature I have been unable to find any record of similar cases of spontaneous hæmorrhage from the great omentum. Dowd's case (*Annals of Surgery*, 1911, vol. liv, quoted by Da Costa, 1919) of an omental cyst is suggestive of a similar occurrence; the hæmorrhage, however, took place between the layers of the great omentum and not into the peritoneal cavity.

E. M. Eberts,

Surgeon to the Montreal General Hospital.

CEREBRAL HÆMORRHAGE SIMULATING URÆMIA

MONTREAL General Hospital, No. 5766, 1919. A merchant, aged sixty years, was admitted to the hospital on December 29th, 1919, complaining of severe headache and vomiting. He had formerly used alcohol fairly freely but not of late years. He had never had syphilis. For many years he had suffered from severe headaches, and for the past year had nocturnal frequency of urination, some shortness of breath, and swelling of the eyelids in the morning. He had been told that he had albuminuria and high blood pressure. One year ago he had an attack similar to the present one but less severe. Of late both vision and memory have been impaired.

His mother died of nephritis and one brother now has that disease.

Present Illness. On December 28th, while on a street car he had a sudden acute pain in the angle of the left eye, felt weak and dizzy, and nauseated. He got off the car and was assisted home. He did not stagger but vomited once before reaching his house. Headache developed and became very severe. The urine was examined and the specific gravity was 1010 and albumen was present. The blood pressure was 170 systolic, and 80 diastolic; pulse, 110; temperature, 99.3°; respiration, 30. There was no paralysis and the reflexes were normal.

He was admitted to the hospital and 350 c.c. of blood was withdrawn from a vein in the arm and hot packs were given with but slight relief of the headache of which he complained most bitterly. It was felt in the forehead and at the back of the neck and was very persistent. He was quite conscious, the face was flushed and the eyelids suffused. There was a marked degree of thickening and tortuosity of the peripheral arteries and the aortic second sound was high pitched and ringing.

On the following morning the tongue was deviated sightly to the right. There was no other indication of muscular weakness, but a Babinski and an Oppenheim reflex were present on the right side, in addition to a slightly exaggerated knee jerk.

The pupils were equal and active, not specially contracted. There was no asynergism. The muscles of the neck were slightly resistent. The ocular fundi showed only arterial thickening.

A lumbar puncture withdrew very bloody fluid under slightly increased pressure, and this was followed by considerable relief of the headache Two days later a severe and persistent pain developed in the lumbar region and in the backs of the legs, and Kernig's sign was present on both sides. Retraction of the neck became more marked and the left pupil became dilated

Fifteen days after admission he was suddenly seized with excessively severe pain in the left temporal region accompanied by sweating, irregular breathing and irregular pulse, but no loss of consciousness. Within two hours three similar attacks occurred, in the last of which he became unconscious and died in a few minutes.

The clinical diagnosis was cerebellar hæmorrhage with effusion of blood into the spinal canal and cardio-renal disease The autopsy showed, in addition to the presence of cardio-renal disease, a fresh hæmorrhage into the posterior tip of the right optic thalamus, which had ruptured into the right lateral ventricle and into the subdural space and had spread out over the cerebellum and down the spinal subdural space to the cauda equina.

Besides this fresh hæmorrhage in the optic thalamus, there was evidence that another hæmorrhage had taken place at this site at a comparatively recent date.

Summary. 1. Onset of headache suggesting uræmia in a man with known cardio-renal disease.

2. Diagnosis of cerebellar hæmorrhage based upon dizziness, slight temperature, vomiting, absence of paralysis and the presence of blood in the spinal fluid.

3. Hæmorrhage about the spinal cord giving rise to severe pain in the back and in the leg with the development of muscular spasms. Kernig's sign present.

4. Relief of headache by lumbar puncture.

J. F. MacIver,
Junior Assistant in Medicine.

G. A. Upham,
Resident Medical Officer
(Service Dr. A. H. Gordon.)

Editorial

ON THE ÆTIOLOGY OF CHRONIC ARTHRITIS

AN opportunity has been afforded, during the recent war, by the gathering together of large numbers of men under medical inspection and observation to attempt an investigation of many obscure medical problems, and among these that of chronic arthritis. This disabling affection proved to be one of the most important affecting the efficiency of the army as a whole, and received an added importance not only from the chronicity of the disease, but also from the fact that it greatly interferes with the usefulness of the soldier when demobilized and returned to civilian life. The results of a prolonged investigation of the condition underlying this affection on four hundred returned invalided soldiers, gathered together in the S. U. Army General Hospital at Lakewood, have just been published (*Archives of Internal Medicine, March*, 1920). The investigation was carried out by Major Ralph Pemberton, already well known from his previous researches on the effect of a modified dietary in this disease. Many of the facts elicited are of much general interest.

While chronic arthritis may occur at any age it has its highest incidence between the fourth and fifth decades of life. The average of age of the soldiers on whom the investigation was carried out was 28·26 years; that of the worst cases showing least improvement was slightly higher, 29·38 years. Most of the men were returned soldiers from overseas, but a considerable percentage came from camps scattered through the country. More than four hundred and twenty were admitted, but the statistics are based only on four hundred cases, the others being eliminated as doubtful in character. Of these four hundred, two hundred and fifty-six (64 per cent.) had arthritis only; one hundred and twelve

(28 per cent) had arthritis and myositis; twenty-two had myositis only and three were listed as doubtful. Exposure to cold and wet, in this group of cases of comparatively young men, took a marked precedence of all other factors (232 or 58 per cent.) as the inciting agent. By the term "exposed to cold and wet" was meant protracted exposure which kept the legs and feet, and often their entire body, wet for many hours, sometimes days and even weeks at a stretch. Sleeping consecutive nights on stone or cement floors, or on wet earth in stone out-houses, was also included under this head and sometimes figured strongly as the causative factor in the conscious experience of the men themselves.

A previous attack of dysentery (thirty-three cases) and also of influenza (twenty-eight cases) appeared to be the chief factor in sixty-one cases or 15 per cent.; thirteen cases were attributed to a previous attack of tonsilitis. In only four cases did the affection develop after a Neisserian infection. Previous attacks of rheumatism had occurred in one hundred and forty-three instances. An analysis of the chief site of disability revealed the involvement of the knee joint in two hundred and forty-eight cases, of the ankle one hundred and forty-one, of the hip in one hundred and thirty-five, and of the shoulder in one hundred and twenty-seven. The phalangeal and meta-carpo-phalangeal joints of the hand were involved in fifty-eight cases. In two hundred and twenty eight cases two or more joints, sometimes several, were affected.

A careful investigation of the relation of foci of infection to the attack gave the following results: In one hundred and seven cases no demonstrable foci were found. In two hundred and ninety-three definite foci of infection were detected. In two hundred and eight cases or 71 per cent. of those showing foci, trouble was found in the tonsils; in one hundred and thirty-four persons a demonstrable dental focus was present. In fifty persons a focus in the genito-urinary tract was found, but for reasons not stated in the present paper Pemberton

did not consider that foci in this tract played a frequent or important rôle in the development of arthritis. Only eight cases gave an undoubted Wassermann reaction, a percentage which Pemberton states was corroborated by his experience in civil practice. Careful observations on the basal metabolism of these four hundred cases showed no definite disturbance which could be regarded as important.

In reference to the detection of special foci of possible infection, Pemberton calls attention to the difficulties involved in any absolute statement. Studies at the hands of many observers, and the experience afforded in this investigation indicate that harmful foci may be contained within tonsils, deeply buried and innocuous in appearance; nose, throat, teeth and genito-urinary tract may all contain infecting foci and require most careful investigation by trained observers, with the assistance of roentgen rays.

The results obtained in this hospital are interesting and encouraging; ninety-four of the cases in whom no focus of infection was discovered, and one hundred and eighty-four of the cases in whom a focus was still present, recovered. Thirty-four recovered and thirty-one were greatly improved after removal of infecting foci, but twenty-eight were unimproved. Three hundred and ten of the total number recovered completely and seventy-four were greatly improved by the treatment undergone; only sixteen remained unimproved. Pemberton says these results are less impressive when indicated by mere figures than when demonstrated by intimate contact with men invalided for months, and in many cases for a year or more by severe, and in some instances widespread arthritis, and who have achieved recovery, without residual pathology along lines of expectant treatment aided by local measures.

It must not be inferred, however, that removal of infecting foci is to be regarded as unimportant, for Pemberton considers that many would have got well sooner had their foci been removed.

CANADIAN RESEARCH INTO INDUSTRIAL HYGIENE

TO assess the influence of the war on science as a whole will be one of the most valuable and interesting duties of the historian; much may also be said on the subject of the stimulus given to Industrial Hygiene. The two central problems of industrial hygiene which cannot be divorced from each other are, the problem of the conservation of human life, and the problem of maximum industrial production; and it was precisely these two problems which the war presented with hitherto unexampled urgency. The emergency pointed the problem; the measures taken by the different countries to meet it indicate the broad lines of its solution, and the scientific investigations and researches conducted provide data for the formulation of definite conclusions. Without attempting here to classify the conclusions reached, it is important to emphasize two fundamental principles which, while to-day on the high road to becoming truisms, certainly had not received anything approaching their full recognition before the war. The first is that industrial hygiene is a science with a sound basis on the natural laws of physiology; the second, that the health of the worker and his efficiency are in the long run inseparable.

Now these two principles place the whole question of industrial hygiene on a new footing. If, as has been said, industrial hygiene is a science based on the natural laws of physiology then those laws must be discovered. There must be scientific investigation into the concrete facts of the case, into the actual relation existing between all the different conditions under which work is carried on; the number of hours, the character of the ventilation and sanitation, the nutrition of the worker, etc., and the output of his work. Again, if the health of worker and his efficiency are inseparable, industrial hygiene ceases to be the concern of the social

Prepared under the direction of a Committee on Industrial Fatigue.

worker and humanitarian only and becomes the pressing business of every employer of labor.

In the words of the Final Report of the British Health of Munition Workers Committee, "The problem of scientific industrial management, dealing as it must with the human machine, is fundamentally a problem in individual capacity, physical and mental, and in industrial fatigue. The rhythms of industrial conditions required by the hours of labour, the pace of machinery or that of fellow workers, are imposed upon the acting bodily mechanism from outside. If these industrial rhythms are faster than the natural rhythms of the body they must produce accumulated fatigue, and cause an increasing debit shown in a diminished capacity for work. It is therefore the problem of scientific management to discover in the interests of output and of the maintained health of the workers what are the maximal efficiency rhythms for the various parts and faculties of the human machine."

Now, in the reconstruction period, it is the duty of each country to apply the lessons learned during the war to the peace-time task of building up natural economic prosperity. That the need of more scientific investigation into the relation of physiology to working conditions is recognized in England may be judged by the appointment of an Industrial Fatigue Research Board, "To consider and investigate the relation of the hours of labour and other conditions of employment, including methods of work, to the production of fatigue, having regard both to industrial efficiency and to the preservation of health among workers." In the United States also scientific methods—that is field investigation, laboratory and practical experiment, and scrutiny and valuation of statistics—are being applied to industrial problems, whether the general problems of all labour or the highly specialized problems of individual industries, with ever increasing universality. Data are accordingly growing in volume very rapidly, not only from the scientific investigations of Government Services and non-Government associations, but also rom the records of insurance offices and Workmen's Com-

pensation Commissions, and, not least important, from the routine statistics of industrial concerns. In this last connection the steadily increasing practice of keeping records for each individual employee, showing output, timekeeping and sickness, etc., will be an invaluable source of material.

Canada, owing to her great distances and widely scattered population and the comparative youth of her industries, is in a somewhat different position and it would probably be impractiable, at the present time, to initiate investigations into problems of industrial hygiene on anything approaching the scale on which they are being conducted elsewhere. At the same time it is of the utmost importance that Canadian industries should have means of keeping in touch with the methods for dealing with industrial problems approved by other countries and should have access to the data acquired both from scientific investigation and research and from actual working experience. It is with the object of rendering precisely this service to Canadian workmen and manufacturers that the Committee on Industrial Fatigue has been constituted under the Honorary Advisory Council for Scientific and Industrial Research The Committee is under the Chairmanship of Professor J. J. R. Macleod, Department of Physiology, Toronto University, and comprises Professor Macallum, Administrative Chairman, Honorary Advisory Council, members of the Departments of Physiology, and Psychology in the various Canadian Universities, a representative of the Department of Labour, representatives of the Canadian Manufacturers' Association, and one woman representing women's organizations and social work. Besides acting as a general clearing house for information on the different phases of the science of industrial hygiene the Committee will undertake certain practical surveys and are prepared to co-operate with manufacturers in any approved scheme for scientific investigation or experiment. Enquiries will be welcomed and should be addressed to the Secretary, Committee on Industrial Fatigue, care of the Medical Building, Toronto University.

The Association

ANNUAL MEETING, VANCOUVER, JUNE 22ND TO 25TH

WE have much pleasure in calling attention to the very interesting programme which has already been arranged for the Annual Meeting. The profession in Vancouver have been very active, and their numerous Committees are hard at work to give their visitors a very pleasant and interesting session. We strongly urge all our friends east and west to make an effort to be present.

The Address in Medicine will be given by Dr. Chas. Lyman Greene of St. Paul, Minn; that in Surgery by Dr. Edward Archibald, of Montreal. The meeting for many reasons will be an important one; among others it will be remembered that the final revision of the Constitution and by-Laws will be undertaken.

The railways have arranged to give a special round trip tourist rate.

We have received from the railways an approximate estimate of the cost of a round trip tourist ticket amounting to $132.70, including war tax. This holds good from June 1st to October 31st, and stop over privileges are accorded.

Members are urged to notify the Secretary of the Committee of Arrangements as early as possible of their intention to be present, and the amount and character of hotel accommodation they will require. Owing to the heavy tourist traffic at this time of the year, unless arrangements are made early there may be many disappointments.

PRELIMINARY PROGRAMME

Address in Medicine—Charles Lyman Greene, M.D., St. Paul, Minn.

Address in Surgery—Edward Archibald, Montreal—"Surgical treatment of ulcerated intestinal tuberculosis as occurring chiefly in course of pulmonary tuberculosis."

SECTION OF MEDICINE

C. F. Martin, Montreal—"Relation of metabolism to clinical medicine.'

A. H Gordon, Montreal—"Treatment of hæmorrhage in medical diseases. '

Wm. House, Portland, Ore.—"Occultism and insanity."

Dr. MacAllister, New Westminster, B.C.—"Facial expression in various types of insanity."

J. A Oille, Toronto—"Functioning of the heart in cardiac disease"

W. Goldie, Toronto—"Signs and symptoms of gastro-intestinal diseases."

A. R. Robertson, Vancouver—"Cerebral syphilis."

W. S. Lemon, Rochester, Minn.—"Pulmonary abscess."

N. B. Gwyn, Toronto—"Encephalitis lethargica."

N. B. Gwyn, Toronto—"Influenzal empyema."

R. H. M. Hardisty, Montreal, and G. E. Richards, Toronto—"Diagnosis of gastric diseases."

G. S. Strathy, Toronto—"The action of arsenic on the liver"

G. H Manchester, New Westminster, B.C.—"Shell shock."

H. A. Lafleur, Montreal—"Spleno-medullary-leukæmia; treatment by benzol and *x*-rays."

John P. Manning, Seattle, Wash.—"Continuous fever in children from streptococci infection in blood stream with recovery"

M. A. Smith, Halifax—"Modern treatment of gastric disease."

J. A. McGregor, London—"To be announced."

H. A. McCallum, London—"To be announced."

Lionel M. Lindsay, Montreal—"Recent advances in our knowledge of rickets."

Section of Surgery

J. McKenty, Winnipeg—"Acute intestinal obstruction."

Hadley Williams, London—"Series of acute perforations of the duodenum and stomach."

W. S. Galbraith, Lethbridge, Alta.—"Surgical achievements of small western hospitals."

A. E. Garrow, Montreal—"To be announced."

W. A. Lincoln, Calgary—"An unusual condition complicating hour-glass conditions."

A. Gibson, Winnipeg—"The need of exact anatomical knowledge in nerve surgery."

A. T. Bazin and A. Ross, Montreal—"Acute and chronic intestinal obstruction."

E. W. Allen, Edmonton!"Carcinoma of colon."

D. W. Graham, Swift Current, Sask.—"Œsophageal strictures."

J. E. Lehman, Winnipeg—"Pulmonary abscess."

Roland Hill, Grand Rapids, Mich.—"The traumatic abdomen."

M. Sharpe, Brandon, Man.—"Local anæsthesia."
N. J. Maclean, Winnipeg—"Duodenal ulcer."
H. A. Bruce, Toronto—To be announced.
J. S. McEachren, Calgary—To be announced.
H. J. Hassard, Portage la Prairie—To be announced
W. J. Stevenson, London—To be announced

Symposium on Thyroid

F. N. G. Starr, Toronto—"Goitre and its treatment."

C. C. Tatham, Edmonton—"Observations and results of the surgical treatment of goitre."

G. A. Bingham and G. E. Richards, Toronto—"Correlation of the results of treatment by surgical and *x*-ray method."

J. M. Pearson, Vancouver—"The medical aspect of goitre treatment."

Genito-Urinary

W. W. Jones, Toronto—"Ureteral stone."
J. A. E. Campbell, Vancouver—"Some phases of syphilis."
Charles H. Hair, Toronto—"Genito-urinary infections."

G. S. Gordon, Vancouver—"On examining and operating by the endo-cystoscope."

G. S. Whiteside, Portland, Ore.—"To be announced.

SECTION OF OBSTETRICS AND GYNÆCOLOGY

Robert Ferguson, London—"A plea for better obstetrics."

W. P. Graves, Boston—"Immediate and late results from the use of radium for non-malignant uterine bleeding."

Louis Frank, Louisville, Ky.—"Radium in the treatment of cancer of the uterus."

H. P. Newman, San Diego, Cal.—"Certain considerations and recommendations in special plastic surgery of the cervix uteri."

A. C. Hendrick, Toronto—"The bleeding uterus, its pathology, diagnosis and treatment."

Angust McLean, Detroit—"Thrombosis and embol in abdomen."

H. M. Little, Montreal—"Modern obstetrical technique."
J. W. Duncan, Montreal—"Toxæmia of pregnancy."

John C. Hirst, Philadelphia—"Operative treatment of cystocele in women of child bearing age."

George H. Noble, Atlanta—"Principles envolved in surgical relief of downward and backward displacement of the uterus."

T. H. Crawford, Calgary—"The kidneys in pregnancy.

J. F. Percy, Galesburg, Ill.—"Heat the most practical and promising treatment in uterine carcinoma."

F. L. Horsfall, Seattle, Wash.—To be announced.

Section of Orthopædics

V. P. Gibney, New York—"Development and scope of orthopædic surgery."

A. R. Macausland, Boston—"Treatment of fractures."

A. Gibson, Winnipeg—"Treatment of habitual dislocation of shoulder."

H. P. H. Galloway, Winnipeg—"Treatment of fracture of the neck of the femur."

James Patterson, Vancouver—"Painful feet."

Fred. H. Albee, New York—"Osteoplastic surgery."

Winnett Orr, Kansas City—"What can we do for the hopeless cripple?"

E. G. Abbott, Portland, Me.—"Compression fracture of the spine."

Section of Eye, Ear, Nose and Throat

G. B. Fletcher, Winnipeg—"Modern uses of the bronchoscope."

Scott Moncrief, Victoria—"Ætiology of idiopathic iritis and its rarity in India."

J. Rosenbaum, Montreal—"Interstitial keratitis."

Sterling Ryerson, Toronto—"The uses of radium in opthalmology."

The following will contribute papers on *x*-ray work: W. A. Wilkins, Montreal—"The diagnostic value of *x*-ray in pulmonary tuberculosis." Dr. J. C. McMillan, Winnipeg—Title to be announced; and others.

HOTELS

We have received information from the Local Committee at Vancouver that Hotel accommodation in that city is heavily taxed during the dates chosen for our meeting. We must therefore urge members who anticipate attending the meeting to make their arrangements without delay, either direct or through the Local Committee, Birks Building

The following is a list of Hotels and their rates:

	Single Rooms	*Double Rooms*
Vancouver Hotel	$4.00 and up	$7.00 and up
Castle "	2.00 " ;	
Barron "	2.50 ;	4.00
Dunsmuir "	;	3.50
St. Regis "	1.50 and with bath, $2.50	

Other Hotels are the Lotus, the Balmoral, and the Regent. Their rates are $2.00 and up

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CANADIAN PUBLIC HEALTH ASSOCIATION

VANCOUVER, JUNE 21ST TO 23RD, 1920

PRELIMINARY PROGRAMME

First Session, Monday, June 21st, 10 a.m.

Canadian Association for Prevention of Tuberculosis (First Session).

Meeting of Sections: Child Welfare, Mental Hygiene, Social Hygiene.

Second Session, Monday, 2 p.m.

Presidential Address—H. E. Young, M.D., C.M., LL.D., Victoria.

Symposium,—"Canadian Public Health, Its Organization and Progress." Led by Dr. John A. Amyot, C.M.G., Deputy Minister of Health, Ottawa, Ont., followed by the Provincial Health Officers and representatives of Canadian Association for the Prevention of Tuberculosis and of the Canadian Red Cross Society.

Third Session, Monday, 8.30 p.m. Public Meeting.

Presidential Address—Canadian Association for Prevention of Tuberculosis.—Hon. Dr. F. L. Schaffner, Winnipeg, Man.

"The Canadian Public Health Association's Programme of Child Welfare Work for 1920."—Dr. L. L. Lindsay, Montreal, Que.

"Canada's Need for Child Welfare Work."—Miss E. M. Forsythe, Toronto, Ont.

Fourth Session, Tuesday, June 22nd, 9.30 a.m.

Canadian Association for the Prevention of Tuberculosis (Third Session).

Canadian National Committee for Mental Hygiene—Executive Committee, 9.30–10.30. Annual Meeting, 10.30–12 Noon.

Section Meetings—Child Welfare, Social Hygiene, Laboratory Workers, 9.30–11.30; 11.30–12 Noon, Address:—Hon. J. D. McLean, Minister of Education, Victoria.

Complimentary Luncheon by the Rotary Club of Vancouver.

Fifth Session, Tuesday, 2 p.m.

Encephalitis Lethargica—Dr. Gordon Bell, Winnipeg, Man.

Symposium:—"Venereal Diseases,"—Dr. M. M. Seymour, Regina; The Hon. Dr. Wm. F. Roberts, St. John, N.B.; Dr. Gordon Bell, Winnipeg, and Dr. Gordon Bates, Toronto. Discussion led by Dr. J. A. Amyot, Ottawa, and Dr. J. W. S. McCullough, Toronto, Ont.

Sixth Session, Tuesday, 8.30 p.m. Public Meeting.

"The Federal Government and Public Health,"—Dr. John A. Amyot, C.M.G., Ottawa.

Section of Child Welfare

Meetings, Monday, Tuesday and Wednesday mornings, 10 a.m.

Reports of the following committees:—Heredity and Eugenics; Vital Statistics; Public School Education; Committee on Mothers; Committee on Obstetrics; Committee on Rural Communities Nursing and Social Work.

Section of Mental Hygiene

Meeting, Monday, 10.30 a.m.

Addresses by:—Dr. C. K. Russel, Montreal; Dr. Gordon S. Mundie, Montreal; Dr. C. K. Clarke, Toronto; Dr. C. M. Hincks, Toronto; Dr. A. T. Mathers, Winnipeg.

Section of Social Hygiene

Meetings, Monday and Tuesday, 10.00 a.m.

Monday:—General Subject—"Treatment of Venereal Diseases," papers by Dr. F. S. Patch, Montreal; Dr. E. J. Trow, Toronto; Dr. R. H. Mullin, Vancouver; Dr. H. C. Cruikshank, Toronto.

Tuesday:—"Social Aspects of Venereal Diseases Problems." papers by the Rev. H. Symonds, Montreal; Mrs. Arthur Murphy,

Edmonton; Mrs. L. A. Hamilton, Toronto; Dr. W. C. Laidlaw, Edmonton; Dr. W. H. Hattie, Halifax.

Laboratory Section

Meeting Tuesday, 10.00 *a.m.*—Papers by Dr. H. C. Jamieson, Edmonton; Dr. J. B. Collip, Edmonton; Dr. R. H. Mullin, Vancouver.

Canadian Association For Prevention of Tuberculosis

Monday, First Session, 10.30 *a.m.*

Report of Secretary and papers by Dr. J. Roddick Byers, St. Agathe, Que.; Dr. C. D. Parfitt, Gravenhurst; Dr. D. A. Stewart, Manitoba.

Monday, Second Session, 8.30 *p.m.*

Presidential Address—Hon. Dr. F. L. Schaffner, Winnipeg.

Tuesday, Third Session, 9.30 *a.m.*

Papers by Dr. Farris, St. John, N.B.; Dr. A. F. Miller, Kentville, N.S.; Dr. J. T. Case, Battle Creek, Mich.

Seventh Session, Wednesday, June 23*rd,* 9.30 *a.m.*

Annual Meeting, Canadian National Council for combatting Venereal Diseases, 10.30 a.m.

Joint Session, Canadian Public Health Association and British Columbia Hospitals' Association.

Symposium on Nursing:—Speakers—Miss Helen Randall, Vancouver; Miss E. Johns, Vancouver; Miss Jean Browne, Regina; Mr. Riddington, Vancouver; and Dr. W. H. Hattie, Halifax.

Eighth Session, Wednesday, 2 *p.m.*

Business Meeting, Canadian Public Health Association.

Wednesday, 8.15 p.m.—Public Meeting auspices Canadian National Committee for Mental Hygiene.

Dr. Charles F. Martin, Montreal.

Addresses by Dr. C. K. Clarke, Dr. C. M. Hincks, Hon. Dr. J. D. McLean, Dr. C. K. Russel and Principal W. H. Vance.

ONTARIO MEDICAL ASSOCIATION

Fortieth Annual Meeting—Toronto, May 25th to 28th

Preliminary Programme

Section of Medicine

Dr. E. C. Rosenow, Rochester—"Studies on influenza."

Dr. A. W. George, Boston—"*X*-ray as an aid in the interpretation of symptoms referable to the biliary system."

Dr. Chas. F. Martin, Montreal—"Psychiatry, from the standpoint of the general practitioner."

Dr. J. W. Crane, London—"Dietetic treatment of infections."

Dr. A. H. Caulfeild and Dr. G. E. Richards, Toronto—"A comparison between the interpretation of the findings in chronic pulmonary lesions n clinical and stereo-roentgenographic examination."

Dr. J. G. Fitzgerald, Toronto—"Analysis of diphtheria deaths in Toronto."

Dr. George Pirie, Toronto—"Vomiting and constipation in infancy."

Dr. Jabez H. Elliott, Toronto—"Pregnancy a menace to the tubercular mother."

Dr. Norman B. Gwyn, Toronto—"Clinical side of empyema in influenza."

Dr. W. R. Campbell, Toronto—"Renal functional tests for the general practitioner."

Dr. E. A. Morgan, Toronto—"Diarrhœa in infancy, general management and treatment."

Dr N. M. Keith, Toronto—"The treatment of renal disease in regard to the newer functional tests."

Dr. G. A. Davis, Toronto—"Interval methods of feeding."

Dr. D. King Smith, Dr. Emerson Trow and Dr. H. A. Dickson, Toronto—"Presentation of some interesting cases of diseases of the skin."

Dr. C. H. Robson, Toronto—"Intratracheal anæsthesia (with exhibition of apparatus)."

Dr. R. D. Defries, Toronto—"Viability of the vaccine virus."

Section of Surgery

Dr. George D. Stewart, New York—"The gastric hypermotility associated with diseases of the gall bladder, duodenum and apprendix."

Dr. N. W. Percy, Chicago—"Technique of the transfusion of whole blood and its value in association with surgical procedures in the treatment of pernicious and other anæmias."

Dr. Edward B. Archibald, Montreal—"Pancreatitis."

Dr. James Masson, Rochester—"Subject to be announced."

Dr. Emerson Hodgins, London—"Tumours of the brain."

Dr. Wallace Scott, Toronto—"Fractures of the skull (their diagnosis and treatment)."

Dr. John R. Parry, Hamilton—"Surgical treatment of empyema."

Dr. S. M. Hay, Toronto—"Diagnosis of some common, acute abdominal conditions."

Dr. E. Stanley Ryerson, Toronto—"Relation of pathological conditions of the gall bladder to treatment."

Dr. D. E. Mundell, Kingston—"Tendon transplantation."

Dr. W. H. Harris, Toronto—"Conditions simulating gastric ulcer."

Dr Roscoe Graham, Toronto—"Significance of pain in the right iliac fossæ.

Dr. Ed. D. Robertson, Toronto—"Treatment of ununited fractures."

Dr. Robert McComb, Toronto—"Perineal prostatectomy."

Section of Obstetrics and Gynæcology

Dr. Thos. S. Cullen, Baltimore—"Distribution of adenomyomata containing uterine mucosa."

Dr. B. P. Watson, Toronto—"Induction of labour."

Dr. E. K. Cullen, Detroit—"Title to be announced."

Dr. W. W. Lailey, Toronto—"Complement fixation test (in gonorrhœa in female)."

Dr. G. G. Copeland, Toronto—"The value of rectal examinations in obstetrics."

Dr. C. J. Currie, Toronto—"Post-partum temperatures."

Correspondence

BIOGRAPHY OF SIR WILLIAM OSLER

To the Editor:

Lady Osler has requested me to prepared a biography of her husband and I shall be most grateful to any of your readers who may see this note, for any letters or personal reminiscences, or for information concerning others who may possibly supply letters.

Copies of all letters, no matter how brief, are requested, and if dates are omitted it is hoped that they may be supplied if possible.

If the originals are forwarded for copy they will be promptly returned.

Peter Bent Brigham Hospital,
Boston, Massachusetts HARVEY CUSHING, M.D.

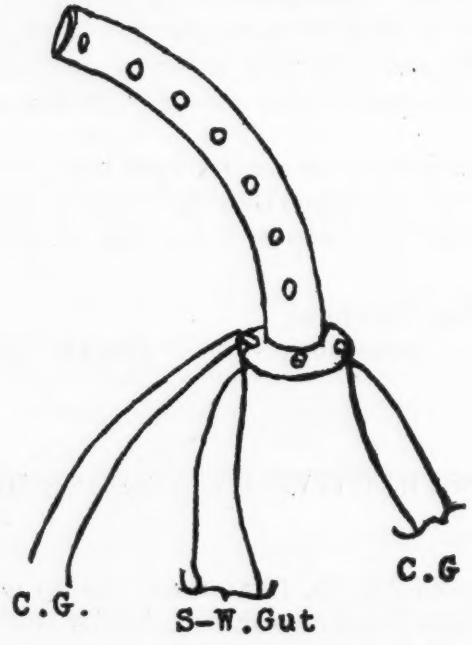
OBSTRUCTIVE DYSMENORRHŒA

To the Editor:

In your issue of March, 1920, there was an article on "Treatment of Obstructive Dysmenorrhœa", by Dr. E. V. Frederick, of Peterboro, in which he mentions a "new type of mechanical treatment" of that symptom, which he had modified from a glass stem used in the Mayo clinic. I would like to call the attention of Dr. Frederick to the fact that a perforated metal stem has been used in such cases in the Montreal General Hospital for at least twenty-five years, the late Dr. T. Johnston-Alloway having brought the idea back from Germany before my connection with that institution in 1894.

The accompanying drawing of the tube is the actual size of the instrument. The tube is composed of either aluminum or silver. It measures 5·5 cm. along the convex side and ·5 cm. less on the other, the diameter being ·75 cm. At the lower end is a collar which has a perforation in the back and front, by means of which

ligatures may be passed to stitch the tube to the cervix. The walls of the tube have numerous perforations through which the uterine discharges may escape. The edges of the upper, or internal, end of the tube are bevelled off, so as to lessen the risk of injury to the walls of the uterus, and it will be noticed that the tube has a curve which follows the usual course of the uterine body. In preparing the instrument for use, a ligature of No. 2 catgut is passed through the anterior lip of the flange and tied at its centre, the ends being left long. A similar ligature is attached to the



posterior lip of the flange. A ligature of silk-worm gut is passed through the opening in the anterior lip of the flange, tied at its centre and also has the ends, which have been left long, tied at their extremities to prevent their irritating the patient. The cervix is dilated and the uterine cavity curetted and douched, after which the tube is passed through the canal and sutured in position by the anterior and posterior sutures of catgut, the ends of which are cut short after being tied. The silk-worm gut ligature is left untouched and serves to effect the withdrawal of the tube, which can be accomplished in from twelve to fourteen days after operation, the patient being kept in the recumbent position until this is done. In properly selected cases of dysmenorrhœa, viz: where the pain begins a few hours before the flow and ceases as

soon as this is thoroughly established, this method of treatment will be found to be everything claimed for it by Dr. Frederick and in many instances pregnancy has followed, a very large percentage of the patients being absolutely cured although they must be warned that the period immediately following the operation may be almost as painful as its predecessors.

Yours faithfully,

F. A. L. LOCKHART

MEDICAL EDUCATION IN CHINA

The following communication on the need for medical education in China has been received:

China is accepting western civilization. Prejudice has largely gone. Intercourse with other nations has brought about enlightenment. Western medicine has gradually won its way into favour, owing to the convincing results of medical and surgical cures, combined with the spirit in which they were wrought. Until quite recently the work of the medical missionary was of a pioneering nature. But these pioneer efforts have resulted in a change of mind, and this has wrought a change in the scope of medical work. Medical science is much more exact and exacting than formerly. Coincidently there is the problem of handling the ever increasing number of patients. Either the number of foreign physicians must be greatly increased, or adequate facilities for training Chinese students, male and female, in accredited medical schools must be provided.

Obviously, the former alternative is impracticable. While a large increase in the number of foreign physicians (and the same is true of dentists and nurses) will be necessary for years to come, it is becoming increasingly doubtful whether, even given the necessary funds, it would be possible to find in Europe and America a sufficient number of highly qualified doctors and nurses adequately to staff the existing medical institutions in China, to say nothing of attempting to cope with the sum total of the medical needs of the country. Even if the quantity of work done is not to be increased, a large number of highly trained Chinese doctors and nurses are needed at the earliest possible moment to carry it on properly, and for this personnel the hospitals must look to the schools.

What is urgently needed is a large increase in the number of duly qualified, graduate Chinese physicians, dentists, nurses

and pharmacists, so as to greatly augment the good done by their foreign colleagues Since the future of medicine in China must be in the hands of her own physicians, wisdom dictates that Western aid should be considered in the light of the future output of Chinese physicians The system of medical education will not be complete unless there are available a small number of teaching hospitals connected with the medical schools, in which the medical students can be given their clinical instruction, and in addition a large number of other well equipped hospitals where nurses can be trained and in which Chinese doctors as internes, resident physicians and surgeons, and finally, as members of the visiting staff, can get, in a stimulating atmosphere, under proper supervision, the practical experience that they need to prepare them for assuming independent responsibility. Otherwise, serious deterioration in professional efficiency is the certain result. In other words, good hospitals are needed to supplement the school training and to conserve the men whom the schools turn out.

The leaders in medical science in China are agreed that in medical education lies the strategic basis for adequate future development. To no other group of professional men is there afforded such intimate opportunity for influencing society. And it is here that sufficient ground is found for pressing forward with medical teaching in Christian institutions. The men who go out with the Christian ideal of service and sacrifice, together with professional training of the highest type, are men who are sure to influence the China of to-morrow.

What has been written above applies also, in almost every particular, to the allied professions of dentistry and nursing. These three healing professions should develop synchronously and uniformly in China, because they constitute an essential trinity, each element of which supplements the others.

Chentu, West China. CHAS. W. SERVICE, B.A., M.D.

Section of Therapeutics

PHOSPHORUS AS A THERAPEUTIC AGENT

J. W. Crane, M.D.

London, Ont.

PHOSPHORUS therapy dates from about the middle of last century, following the discovery that phosphorus was a constituent of normal blood. Churchill of Paris[1], in a paper published in 1858, enunciated the theory that tuberculosis was due to a deficiency of phosphorus in the blood. The drug produced its beneficial results because it was a hematinic. He claimed the production of new blood was so great that the patients suffered from hæmorrhages from the nose and from hæmorrhoids. Some of his patients grew heavy beards in an incredibly short time, others cut wisdom teeth with astonishing rapidity. The bed-ridden rose and walked.

The hypophosphite was chosen because phosphorus was too irritating and secondly because it was the form of phosphorus which was readily oxidized "The tuberculous diathesis depends on a diminution in the element phosphorus and that this element, having to play the rôle of a combustible body, must be administered in a less completely oxidized form than that of phosphoric acid."[2] The inorganic salts became popular, especially the preparation known as Parrish's Chemical Food (Syr. Ferri Phosph. Co.). Later the medical profession had to pass through the era of organic preparations. The glycerophosphates were introduced in medicine by Robin[3] in 1894, and were recommended for malnutrition. Their use became so popular that they are now inc uded in nearly every foreign pharmacopea. Among the more recent additions to the list of organic preparations are phospholecithin, sanatogen and Wincarnis, the last a preparation of glycerophosphates in red wine. Wincarnis is recommended (to quote from the literature sent out by the manufacturer) "as a general tonic and is indicated for what is vulgarly termed general debility, also for the weak, anæmic, nervous or emaciated; of special value in anæmia, chlorosis, neur-

Read before the Harvey Club, London, Canada, January 13th, 1920.
From the Department of Pharmacology, Western University Medical School.

asthenia, senility and cachexia due to tuberculosis or other chronic diseases".

The organic preparations have no advantages over the inorganic. Hart, McCollum and Fuller's[4] experiments on growing pigs showed that there was no difference in the growth curve when organic or inorganic phosphorus was added to the diet. Other investigators, Wendt[5], Holsti[6] and Gregerson[7] demonstrated that the body can synthesize organic phosphorus from inorganic compounds. Fingerling[8] fed a flock of geese for a year on food containing only inorganic phosphorus. Next year the diet was rich in organic phosphorus, and the results were compared. The number of eggs laid, the total weight of the eggs, the content of lecithin, nucleic acid and phosphorus were practically the same. McCollum, Halpin and Drescher[9] made observations on the effects of inorganic and organic phosphorus compounds in the diet of hens and concluded that the organic preparations had no advantages over the inorganic. Marshall[10] of the Johns Hopkins Hospital investigated this same problem and his conclusions agreed with the findings of the other investigators.

The discovery that the nervous system was comparatively rich in phosphorus, extended the therapeutic field of the drug. The result has been, that it is recommended for many diverse functional nervous diseases. It gained the reputation as a "general tonic"—a term which is still used too often as a cloak for our ignorance and "an indefinable limbo into which anyone can thrust anything of which he knows little or nothing".

A fair percentage of our patients require a tonic often because they suggest the diagnosis and treatment. They are "run down and only need a tonic". Many of our patients suffer from functional nervous conditions and all of them, according to Osler, have tuberculosis. It is not at all surprising then, that the hypophosphites became a panacea of almost universal use.

Marriott[11] at the request of the Council on Pharmacy and Chemistry of the American Medical Association, studied the therapeutic value of hypophosphites. He postulates that a drug must do one of three things if it is to be of any benefit; it must produce a local or general physiological effect; it must exert a specific, demonstrable influence on pathological conditions; or it must have a food value. In his experiments he gave fifteen grains of hypophosphites three times a day to normal men, and found that it produced no symptoms and almost all of the drug was excreted unchanged. Other investigators claimed to have recovered the entire amount unchanged in the urine. Marriott concludes with the following

statements: "In the absence of proof as to the value of the drug, we are not justified in using it merely because it may do good. It is doubtful if there are any conditions when the body suffers from lack of phosphorus. A half glass of milk contains more available phosphorus than three larges doses of hypophosphites of fifteen grains each. There is no reliable evidence that the hypophosphites have any physiological effect. It has not been demonstrated that they influence any physiological process. They are not 'foods'. If they have any use, that use has never been discovered."

Fellow's Syrup of Hypophosphites has been among the most popular preparations. No very exact information about its composition can be obtained from the manufacturers beyond the fact that it contains 1/64 grain of strychnine to each drachm along with the hypophosphites of iron, quinine, calcium, manganese and potash. This uncertainty as to its composition puts it in the class of nostrums; and secrecy in medicine impedes rather than advances the progress of medical science. The extravagant claims made by its manufacturer remind one of a patent medicine testimonial. For example, they make this statement: "the fact has never been challenged that in Fellow's Syrup of Hypophosphites we have one of the most efficient, most complete, most all-round tonics and roborants in the materia medica."

Since the action of hypophosphites alone is under discussion, no reference has been made as to the effects of strychnine, quinine, iron, calcium, manganese and potassium. It is impossible to exactly determine their effects because one is dealing with a number of different factors in a mixture of so many drugs. The ordinary preparation of hypophosphites may be a convenient form in which to administer the inorganic radicals, *e.g.* iron, manganese, etc., or the alkaloids, *e.g.* quinine and strychnine. This is the only justification for the use of any of the preparations of hypophosphites.

The following testimonial[12] of a physician has a very obvious moral: "Just about six years ago I had a severe attack of La Grippe which almost killed me. Left me with asthma (Catarrh) and a severe cough. Did not get out of the house for three months. Took over a dozen bottles of McArthur's Hypophosphites, came out all right and have since then worked hard. Last fall took another cold but worked on, used McArthur's Hypophosphites, am using it now and am on my twelfth bottle. I have five or six patients whom I have put on McArthur's Hypophosphites but I do not prescribe the single bottle but wholsesale, no less than six bottles. One patient is on his twenty-fourth bottle with orders to get another half-dozen and keep it up all winter. I have given

the same order to all (keep it up all winter), and I myself intend to do the same, for with its use I have lost no time—rain or shine, I am doing my work. I know what it has done for me and what it is doing for my patients."

Summary

1. It is now known that tuberculosis is not due to a deficiency of phosphorus.

2. There is no justification for giving hypophosphites for the sake of the phosphorus content, because very little, if any, of the hypophosphite is metabolized. It is excreted unchanged.

3. Phosphorus medication either as hypophosphites, phosphates, glycerophosphates or phospholecithin has no definite value in the treatment of pathological conditions, nor do they have any value as foods.

4. Many physicians still use the hypophosphites partly from force of habit, partly because of the psychological effect of the propaganda carried on by the manufacturers who laud their wares most extravagantly.

5. If there is ever a definite indication for the use of phosphorus, one and a half pints of milk or three eggs daily will supply more phosphorus than the patient can metabolize.

6. If the profession is to learn more about the action of drugs, it is essential that the patient be given one drug (instead of a mixture of from three to ten). Accurate observations should be made and recorded and finally an analysis of the results obtained.

BIBLIOGRAPHY

1. Churchill, J. Francis.—"De la cause immédiate et du traitement spécifique de la phthisie pulmonaire et des maladies tuberculosis," Paris, 1858.

2. Quoted by Marriott, W. K., *J. A. M. A.*, lxvi, p. 486, February 12th, 1916.

3. Robin.—*Bull. de l'Acade. Med. Paris*, Ser. 3-31-419

4. Hart, E. B., McCollum, E. V. and Fuller, J. G.—"The rôle of inorganic phosphorus in the nutrition of animals." *Am. J. Physiol.*, xxiii, p. 246, 1909.

5. Wendt.—*Skand. Arch. f. Physiol.*, xvii, p. 211, 1905.

6. Holsti.—*Skand. Arch. f. Physiol.*, xxiii, p. 143, 1909.

7. Gregerson.—*Ztschr. f. Physiol. Chem.*, lxxi, p. 49, 1911.

8. Fingerling.—*Biochem. Ztschr.*, xxxix, p. 239, 1912.

9. McCollum, E. V., Halpin, J. G., and Drescher, A. H.—"Synthesis of lecithin in the hen and the character of the lecithins produced," *J. Biol. Chem.*, xiii, p. 219, 1912.

10. Marshall, E. K., Jr.—"The Therapeutic Value of Organic Phosphorus Compounds," *J. A. M. A.*, lxiv, p. 573, February 13th, 1915.

11. Marriott, W. M.—"The Therapeutic Value of the Hypophosphites," *J. A. M. A.*, lxvi, p. 486, February 12th, 1916.

12. "The Hypophosphite Fallacy," Report of the Council on Pharmacy and Chemistry, *J. A. M. A.*, lxvii, p. 760, September 2nd, 1916.

Obituary

JOHN E. KIDD, M.D.

We regret to learn that Dr. John E. Kidd, of London, graduate of the Western University Medical School, died from injuries received at a level crossing of the G.T.R. Dr. Kidd was a member of both the Canadian Medical and the Ontario Medical Associations, and of the Harvard Club of London. He leaves a widow and three children.

Dr. A. P. Reid died at his home in L'Ardoise, Cape Breton, on February 27th. He was a graduate of Edinburgh University. He was one of the best known men of the medical profession in Nova Scotia He was superintendent of the Nova Scotia hospital at Dartmouth for fifteen years, was then appointed secretary of the Provincial Health Board and later held the office of Provincial Health Officer till 1914. He was eighty-five years of age.

Dr. W. G. Hepworth, the pioneer physician of the Klondike, died recently at Steveston at the age of fifty-two. He graduated from McGill University in 1895.

Dr. C. Gordon Hewitt, Dominion entomologist, died at Ottawa, February 29th.

Dr. H. C. Clermont died of pneumonia after a short illness, at his home in Montreal He served continually in the war, both in hospital and at various stations at the front line, and on demobilization took up a special course of study in Paris. He was decorated with the French "Medaille des Epidemies". He was a graduate of Laval University and forty-four years of age.

John A. Allen, M.D., died at Medical Lake, U.S., of pneumonia, March 6th. He was the eldest son of James Allen, Toronto.

Dr. George R. Dobson, after a lingering illness, died at Moncton, February 21st.

THE death was lately announced of Kenneth A. J. Mackenzie, M.D., dean of the medical faculty of the University of Oregon, who succumbed to heart disease superinduced by influenza. He was born in Manitoba and was a graduate of McGill University. He held the degree of the Royal College of Physicians and Surgeons, Edinburgh, Scotland. He was sixty years old.

DR. JAMES A. BUCHAN died suddenly at Toronto, March 13th, from shell injuries received when overseas. He was fifty-four years of age.

DR. W. E. NEWCOMBE, acting medical health officer for the North Vancouver district schools, died of pneumonia following influenza on March 9th. He was a native of New Brunswick and graduated in medicine at McGill University in 1909.

Miscellany

News

NOVA SCOTIA

THE authorities of Dalhousie University, Halifax, have decided upon the establishment of a course in public health nursing, under the general control of the Faculty of Medicine. The curriculum which has been laid down is very complete, requiring approximately two hundred and seventy periods in didactic instruction and an average of more than three hours daily in practical and field work, and extending over six months. Only graduates of Schools of Nursing approved by the University are accepted for the course, and applicants must also satisfy certain standards in respect to matriculation, which correspond very closely with Grade XI Certificates of the Nova Scotia schools. Much of the didactic instructon has been assigned to the Staff of the Faculty of Medicine, but a number of others, notably officials of the Provincial and City

Departments of Health, Massachusetts-Halifax Health Commission, School Inspection Service, Victorian Order of Nurses, Welfare Bureau and Kindred organizations are to be ut lized in the teaching. The Nova Scotia Provincial Branch of the Red Cross Society has heralded its acceptance of the recommendations of the Cannes Convention by offering twenty substantial scholarships to candidates for this course. It had been intended to begin classes February 23rd, but on account of the prevalence of influenza, it was deemed wise to delay the commencement for a short time so that those who have applied for the course might be available for general nursing at a time when the demand for nurses so greatly exceeds the supply. Full information relative to the course may be obtained on application to Dr. John Stewart, Dean of the Faculty of Medicine.

NEW BRUNSWICK

ST. JOHN'S municipal council has accepted the recommendations of the General Public Hospital commissioners for the construction of a nurses' home at a cost, according to the tenders submitted, of $189,018.

DR. MARGARET PARKS has been appointed medical inspector under the Dominion Government, in connection with immigration at the port.

THE sum of three thousand dollars was unanimously voted by the Local Red Cross in response to a petition from the St. John Society for the Prevention of Tuberculosis for spreading the work of the free clinic, established by them in the city.

THE report of the Nineteenth annual meeting of the St. John Victorian Order of Nurses showed considereable extension of the work. Expenditures amounted to $6,966.53, and the balance on hand, $1,002.88. The nurses' report showed the total number of cases treated were 1,111, and of visits made, 8,128.

AT a meeting of the St. John Medical Society, Dr. George G. Melvin gave a full explanation of the operation of the New Brunswick Health Act, elucidating points which had not been clearly understood.

Book Reviews

MODERN MEDICINE AND SOME MODERN REMEDIES. Practical Notes for the General Practitioner. By THOMAS BODLEY SCOTT. With a preface by SIR LAUDER BRUNTON. Second edition. 198 pages. Price 6/6 net. Publishers: H. K. Lewis & Co., 136 Gower Street, London, W.C.1., 1919.

This small volume, very pleasantly written, is full of useful and thought-stimulating suggestions for the general practitioner, for whom the field of observation and research is regarded by many as very limited. The writer frequently emphasizes Mackenzie's statement that the earnest observing physician in general practice sees disease in its inception, and is able to watch its course through its stages of development, and unfortunately, often till it terminates in death, and this in a way that the hospital physician, even although favoured with the assistance of many scientific appliances, is not always able to do. The experience of such a man often makes him the more successful therapeutist. In this volume the writer discusses the ætiology and treatment of three disturbing conditions in the light of our present advance in knowledge; Disorders of the Heart, Arteriosclerosis, and Chronic Bronchitis often ending in Bronchial Asthma. An interesting chapter follows on Therapeutic Speculations and Doubts; a chapter largely occupied by a discussion of the comparative therapeutic value of the internal secretions. We have read the book, which has now reached a second edition, with much pleasure, and can recommend it to our confrères. We may add, the writer was the physician and friend of Robert Louis Stevenson, and it was his kindness and attention to Stevenson that stimulated th writing of those never-to-be-forgotten lines on the physician: "There are men and classes of men that stand above the common herd; the soldier, the sailor, and the shepherd not infrequently; the artist rarely; rarelier still the clergyman; the physician almost as a rule. He is the flower (such as it is) of our civilization, and when that stage of man is done with and only remembered to be marvelled at in history, he will be thought to have shared as little as any in the defects of the period, and most notably exhibited the virtues of the race." A. D. B.

COMMON DISEASES OF THE SKIN, WITH NOTES ON DIAGNOSIS AND TREATMENT. By G. GORDON CAMPBELL, B.Sc., M.D., C.M., Lecturer in Dermatology, McGill University. The Macmillan Company, New York, 1920.

As far as we know this is the first work on Dermatology written by a Canadian living in Canada. It is a book of 230 pages, profusely illustrated from photographs of cases seen by the author, and taken by him in the Montreal General Hospital. The illustrations are very fine and many of them show to perfection the diseases described, *e.g.*, Lupus Erythematosis, Lichen planus, Erythema multiforme, Herpes, and many others.

The author says the book is not intended to take the place of the larger works on Dermatology but can be used as a ready reference handbook. It is a book every student and practitioner should have for all the ordinary skin diseases are so profusely illustrated by typical cases that he who looks may be helped very much in his diagnosis.

The treatment is short and simple and one is not confused with very various and opposite treatments to choose from. We congratulate Dr. Campbell on having produced so practical, useful and illuminating a book on Dermatology.

F. J. S.

DISEASES OF THE NOSE AND THROAT. By HERBERT TILLEY, B.S., F.R.C.S., surgeon ear and throat department, University College, Hospital London. 844 pages with illustrations. Price 25/- net. Publishers: H. K. Lewis & Co., Ltd., 136 Gower Street, London, W.C. 1, 1919.

The fourth edition of Tilley's book on Diseases of the Nose and Throat is more complete than previous editions and contains much new matter.

There are new chapters devoted to affections of the trachea and of the œsophagus, intra-nasal dacryocystotomy, and the operation for approaching the pituitary body through the intra-nasal route. In this latter connection the author favours lateral rhinotomy followed by sub-mucous resection of the posterior third of the septum.

The chapters treating of Frontal Sinusitis, the Technique of Enucleation of the Tonsils, and of Endoscopy have been brought up to date. Tilley uses the Bruning's instruments for work in the lower air passages in preference to those of Chevalier Jackson which most men on this side of the ocean prefer.

In the treatment of papilloma of the larynx the author does not refer to the use of electrical dessication which we have found very helpful in such cases.

The final chapter is devoted to medical formulæ, many of which will be found useful to those interested in this subject.

The classification of the book is excellent and the subject matter gives the author's own experience without padding. This sincerity adds greatly to the interest of the work.

The book is exceptionally well written, most comprehensive in its scope, and the illustrations are numerous and well executed. We can heartily recommend it to the student, the general practitioner and the specialist.

The value of the work is enhanced by good paper and clear type.

R. H. C.

HALF A CENTURY OF SMALL-POX AND VACCINATION. Being the Milroy Lectures delivered before the Royal College of Physicians of London, March, 1919. By JOHN C. MCVAIL, M.D., LL.D. Price, 5/6 net. Publishers: E. & S. Livingstone, 17 Teviot Place, Edinburgh.

The author of this book, Dr. J. C. McVail, Edinburgh, is one of the greatest living authorities on small-pox, and any contribution he makes to medical literature on the subject is well worth perusal. The book consists of three lectures, and an appendix, which contains a reply to some observations of Dr. McVail by Dr. C. K. Millard, M.O.H., Leicester.

The first lecture, largely statistical, reviews the history of small-pox during the past century and a half. Some very striking figures are submitted to show what great success has attended vaccination and what a remarkable decline has taken place in the fatality, infectivity and prevalence of this disease in modern times.

A large part of the second lecture is devoted to rebutting the contention of Dr. Millard and others that compulsory infantile vaccination should be discontinued, because it often makes small-pox so mild as to be unrecognizable with consequent spread of infection due to missed cases. Dr. McVail's view that such a proposition is contrary alike to the "principles of medical ethics and to the interest of public health" will be upheld by most epidemiologists.

The last lecture considers in detail the usual measures for the prevention and control of disease. It is very readable. He tells

how he deals with small outbreaks at Ardencaple, Crianlarich, Ardlui, and takes us to scenes in the wilds, "beside locks and frozen streams and snow clad mountains.' His digression to describe the beautiful scenery of the West Highlands—the romantic country of Prince Charlie and the rebellion of "Forty-five" makes this chapter especially interesting. R. St. J. MacD.

MORTALITY STATISTICS OF INSURED WAGE-EARNERS AND THEIR FAMILIES. Experience of the Metropolitan Life Insurance Co., Industrial Department, 1911–1916, in the United States and Canada. By LOUIS I. DUBLIN, PH.D., statistician and others. Published by the Metropolitan Life Insurance Company, New York, 1919.

This is a very interesting volume containing an immense amount of valuable information with reference to the causes of death.

Medical Referees and Life Insurance Managers will find it an excellent reference book and worthy of a place in their libraries.
D. D. MacT.

MIND AND ITS DISORDERS. A Text-Book for Students and Practitioners. By W. H. B. STODDART, M.D., Lond., F.R.C.P., Lecturer on Mental Diseases to St. Thomas's Hospital, etc. Third edition. Illustrated. Demy 8vo. Publishers: H. K. Lewis & Co., Limited, 136 Gower Street, London, W.C. 1.

Dr. Stoddart's well-known book "Mind and Its Disorders" of which the third edition is now issued, needs no introduction to the medical profession. It has always been considered one of the best text-books for students and practitioners of medicine printed in the English language.

In the preface to the third edition Dr. Stoddart says, "Since the last edition I have fundamentally changed my attitude towards mental disease, having personally investigated very many patients by the psycho-analytic method and thus being convinced of the truth of Freud's doctrines. Mental disease can only be understood by studying the psychology of the unconscious mind of the patient, and the physical manifestations of a functional nervous disorder must be regarded as secondary, not primary, as I taught in the first edition." Dr. Stoddart, like so many psychiatrists, has swung over to Freud's theories, which is unfortunate. It is well recognized by every psychiatrist that the only true way

of looking at mental diseases to-day is from the individual psychological viewpoint and in teaching us to take this viewpoint Professor Freud has helped a great deal. There has, however, been too much of a tendency to think of and treat a patient from a purely Freudian viewpoint.

The anatomical, physiological and psychological divisions of psychiatry are well placed before the reader in this volume. He discusses the different classifications of normal and abnormal psychology, giving the ideas of different psychiatrists. The third part of the book on mental diseases is well written and covers the whole field of psychiatry in a modern and up-to-date manner.

G. S. M.

THE HEALTH OF THE TEACHER. By WILLIAM ESTABROOK CHANCELLOR, M.D. Price, $1.25. Publishers: Forbes & Company, 443 S. Dearborn Street, Chicago, 1919.

Dr. Chancellor divides the subject into two parts. In the first part he takes up the common illnesses of teachers in the U.S.A. He classifies the teachers according to their racial descent, and also according to their temperament, discussing the various diseases that each is liable to experience.

In Part II he gives advice as to the best means to be taken to keep one's health.

There is a good deal of information in the book; but it is somewhat hard to read, and at times the reasoning is difficult to follow.

G. W. J.

DR. JOHN TODD, of McGill University, accompanied by Dr. Burt Wolbach, of Harvard Medical School, left some time ago for Geneva to confer with the general medical director of the League of Red Cross Societies concerning inquiries the League will carry on in Poland in connection with the study of typhus fever. Other members of the commission are proceeding to Poland. The country is confronted with the worst typhus epidemic in the history of the world, according to Colonel Gilchrist, head of the American anti-typhus expedition in Europe. Thousands of cases are being imported into Poland from the Ukraine and the east by refugees and released prisoners. Bolsheviki armies are ridding themselves of typhus cases by shipping them to the Polish border. There is a high death rate among the doctors treating the stricken.